Description of Clinical Outcomes and Utilization of Physical Therapy in Patients with Shoulder Disorders.

Brian G. Leggin, PT, DPT, OCS: Penn Therapy and Fitness at Valley Forge, Berwyn, PA.

Case Report Presentation:

Purpose: To describe the clinical outcomes and utilization of physical therapy for rehabilitation of common shoulder disorders across 10 health system based outpatient physical therapy practices. Understanding the expected outcome and utilization for common shoulder disorders may contribute to improved clinical practice.

Methods: This study included 488 patients (203 males, 285 females; mean age = 57.2 ± 14.0 years) who received outpatient physical therapy for a shoulder disorder. Standardized methods for classification of patients to shoulder disorder and collection of outcome variables were used at initial evaluation and discharge from physical therapy. Data were gathered from 60 therapists working in 10 outpatient clinics over a 2 year period. Patients were classified into one of 32 standardized shoulder non-operative or post-operative diagnoses. For this study, we included diagnoses that included at least 50 patients. Among 820 patients entered during the study period, 60% fell into one of these 4 diagnostic groups and included rotator cuff tear (RC Tear = 140 patients), rotator cuff disease without a tear (RC-NT = 213 patients), arthroscopic rotator cuff repair (Arth RCR = 62 patients), and frozen shoulder (n = 72). Descriptive statistics were calculated for baseline characteristics of patients in each diagnostic category. For all patients scores for the Penn Shoulder Score at initial evaluation and discharge as well as a 7-point global rating of change were obtained. The number of therapy sessions was also collected. The percentage of patients who achieved the minimal clinically important difference (MCID) on the Penn Shoulder Score (PSS) was determined for each group.

Results: The mean age of patients with a rotator cuff tear was 61.3, was seen for an average of 12.2 visits, and achieved an average PSS change of 27.7 points. The mean age of patients with RC-NT was 54.5, was seen for an average of 9.2 visits, and achieved a change of 24.0 points on the Penn Shoulder Score. The mean age of patients following rotator cuff repair was 56.8, were seen for an average of 20.2 visits and achieved an average change of 49.8 on the PSS. The mean age of patients with frozen shoulder was 57.8, was seen for an average of 12.6 visits, and achieved an average change of 24.9 on the PSS. The percentage of patients achieving the MCID in each category were as follows: RC Tear = 89%, RC-NT = 84%, Arth-RCR = 98%, frozen shoulder = 79%.

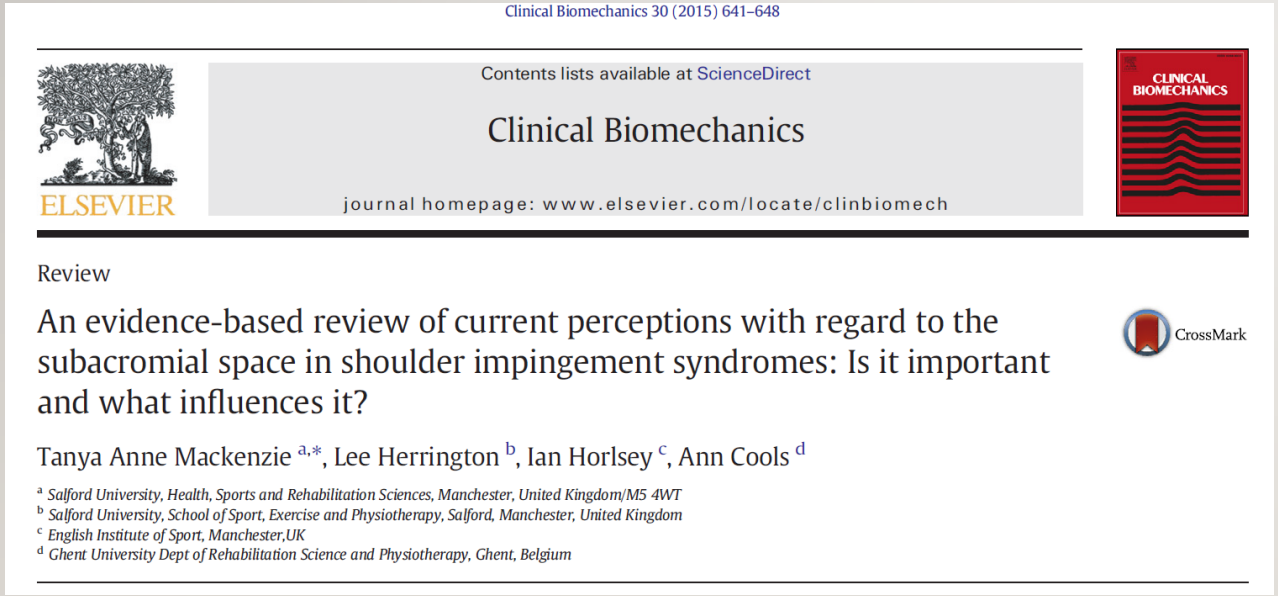
Discussion: Clinically meaningful improvements in outcome were achieved in the 4 diagnostic groups presented.

Clinical Application: Clinicians can use this information to gauge prognosis and outcomes of patients with similar conditions

RELATIONSHIP BETWEEN EXTRINSIC FACTORS AND THE ACROMIO-HUMERAL DISTANCE

TANYA ANNE MACKENZIE, LEE HERRINGTON, IAN HORSLEY, LENNARD FUNK, ANNE COOLS

BACKGROUND



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Review

An evidence-based review of current perceptions with regard to the subacromial space in shoulder impingement syndromes: Is it important and what influences it?

Tanya Anne Mackenzie [a,*], Lee Herrington [b], Ian Horlsey [c], Ann Cools [d]

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Literature review
Publication building on the work of previous authors

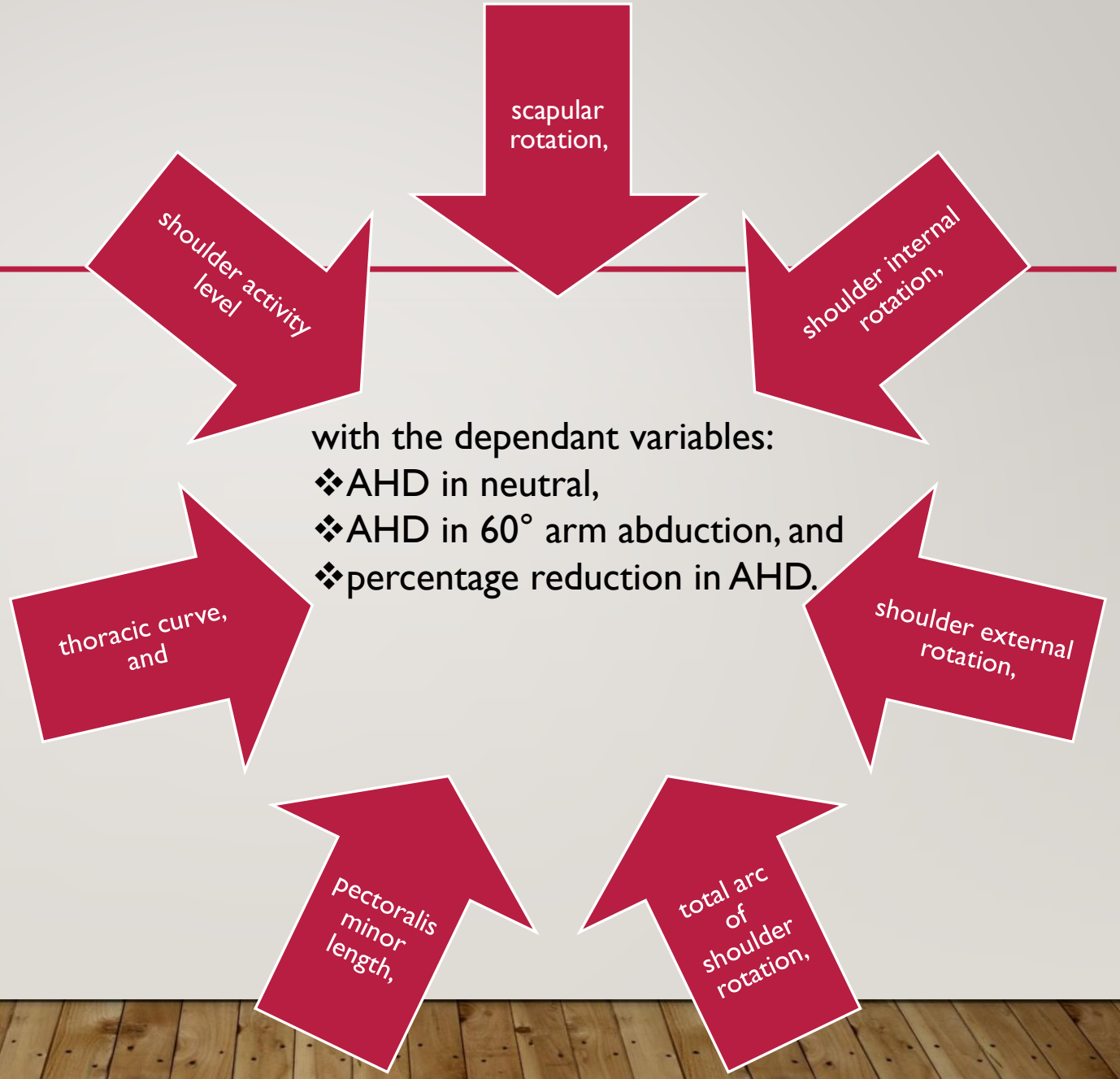
BACKGROUND

- The exact cause of subacromial pain syndrome remains controversial, and possibly the causes are multifactorial[1]
- Reduced acromio-humeral distance (AHD) has been associated with subacromial pain syndrome[2-5] and proposed as a predictive marker[6]
- **Maintenance** of the subacromial space is important in subacromial pain syndrome *regardless of whether it is a cause or consequence*[7]
- Research exploring the correlation between biomechanical factors and the subacromial space, using the latter as the outcome measure, would be beneficial

STUDY AIMS

- To establish if relationship exists

between the independent variables of:



with the dependant variables:

- ❖AHD in neutral,
- ❖AHD in 60° arm abduction, and
- ❖percentage reduction in AHD.

METHOD

72 male control shoulders (24 years STD 7 years)
186 elite sportsmen's shoulders (25 years STD 5 years)

Table 1. Summary participants included in the study. Golfers were professionals playing on the (European) Challenge tour. The other athletes represented the Great Britain team Olympians (podium and podium potentials).

Group	Total n = shoulders	Subgroup n = shoulders
Male controls	72	
Male sportsman	186	90 golfers
		30 gymnasts
		16 canoeists
		36 boxers
		14 archers

Participant position for the procedures:

- standing posture
- No modification of the participants' posture or conform to a single standardised posture.
- Two arm positions = shoulder neutral + 60° AM abduction

METHOD

Variable	Instrumentation Intra-rater 24 hours apart ICC3.1(95%CI)	Procedure 3 repeated measures (Participant position)	Images	Measurements
Scapular rotation	PALM palpation meter (Performance Attainment Associate, St.Paul, MN, USA) 0.92(0.87-0.96)	*Measurement 1.* Distance between the inferior angle of the scapula and the closest horizontal spinous process of thoracic spine (IAS-Sp). *Measurement 2.* Distance between the root of the spine of the scapula and the closest horizontal spinous process of the thoracic spine (RSS-Sp). *Measurement 3.* Distance from the inferior angle of the scapula to the root of the spine of the scapula (RSS-IAS) (Standing)		

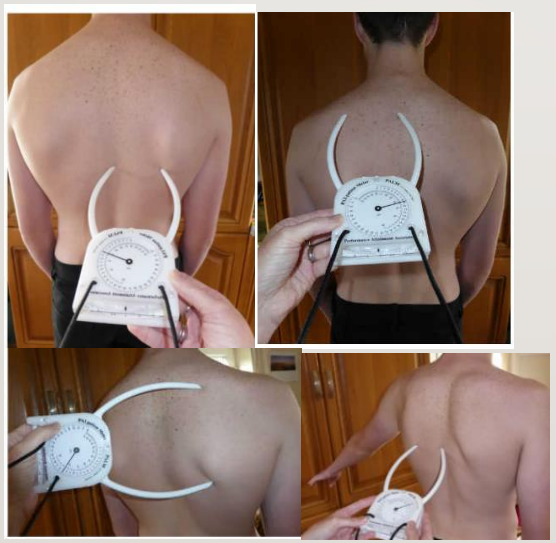
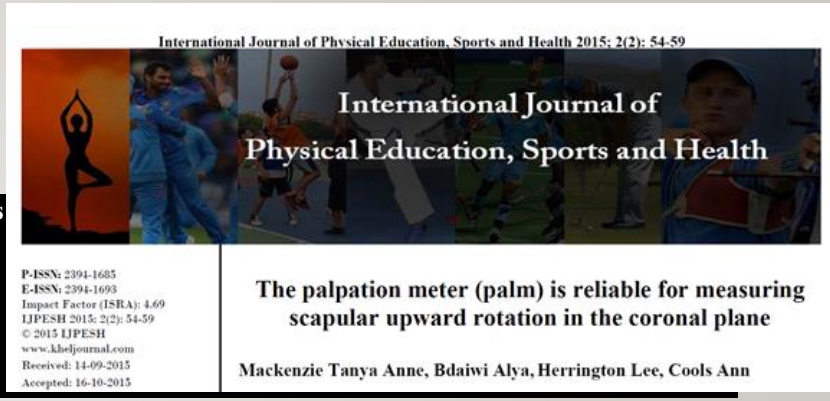


Figure 1.Measurements in arm neutral and in 60° of arm abduction.



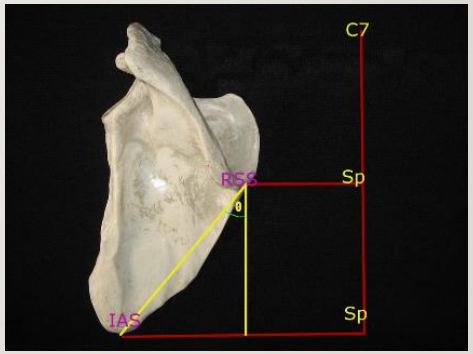


Figure 2. Calculation of scapular rotation

If a perpendicular line is dropped down from the root of the spine of the scapula (RSS) to intersect the horizontal line between the inferior angle of the scapula and the closest spinous process of the thoracic spine (IAS-Sp), a right angle triangle is created. The hypotenuse is the distance IAS to RSS. The side opposite the angle θ was defined as the angle between the hypotenuse and the vertical and the vertical is the distance IAS-Sp minus the distance RSS-Sp. To calculate the angle one can apply:

$$sin\ \theta = \frac{opposite}{hypotenuse}$$

METHOD

Variable	Instrumentation Intra-rater 24 hours apart ICC3.1(95%CI)	Procedure 3 repeated measures (Participant position)	Images
Shoulder rotation ranges	A 360° inclinometer with digital protractor and angle finder gauge (Universal Supplies Limited). 0.91(0.85-0.96)	The inclinometer was adapted with a 30cm plastic ruler attached along the length of the inclinometer, and the ruler was used to align the inclinometer between the olecranon process and the ulnar styloid. The angle was measured in the vertical plane.(Supine)	

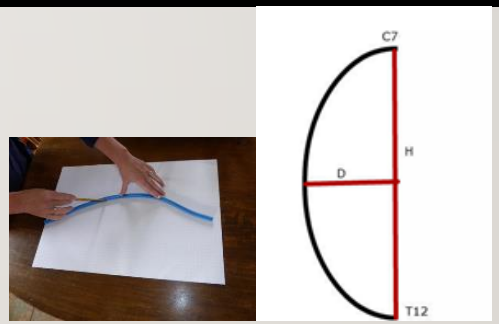
Figure 3. Measure of shoulder rotation

METHOD

Variable	Instrumentation Intra-rater 24 hours apart ICC3.1(95%CI)	Procedure 3 repeated measures (Participant position)	Images
Pectoralis minor length	PALM(Performance Attainment Associate, St.Paul, MN, USA) 0.98(0.96-0.99)	PALM measured the distance between the two palpated landmarks of the anterior aspect of the acromion and the ipsilateral fourth rib sternal notch. (Supine)	

Figure 4. Measure of pectoralis minor length

METHOD

Variable	Instrumentation Intra-rater 24 hours apart ICC3.1(95%CI)	Procedure 3 repeated measures (Participant position)	Images	Measurements and calculations
Thoracic curve	A 40cm Helix flexicurve ruler 0.98(0.97-0.99)	The flexi curve was moulded to the contour of the participants' thoracic spine and the previously marked bony landmarks of C7 and T12 were transferred over to the flexicurve with a water soluble pen. (Standing)	 Figure 5. Measure of thoracic curve.	 Figure 6. Calculation of thoracic curve angle The concave side of the flexicurve was traced onto the graph paper. The corresponding levels of C7 and T12 were also transcribed on the graph paper. Calculation of thoracic ratio. $\theta = 4 \times [\arctan (2D/H)]$.

METHOD

Variable	Instrumentation Intra-rater 24 hours apart ICC3.1(95%CI)	Procedure 3 repeated measures (Participant position)	Images	Measurements and calculations
AHD	Portable RTUS scanner M Turbo with HFL38/13-6 MHz linear transducer (Sonosite Limited. Hitchen, UK), Pre-set parameters for musculoskeletal shoulder settings. 0.92(0.84-0.96)	US transducer placed in the coronal plane parallel with the longitudinal axis of the humerus. (Standing)		 The shortest tangential measure between of the hyper echoic landmarks of the most superior aspect of the humerus and acromion are shown on the US image. Electronic line callipers were used to make the measurements.

Figure 7. US transducer placement

Figure 8. US image

METHOD

- To measure the impact of activity as a variable, the Roa-marx activity scale was used to collect data on the load, frequency, and level of activity to which the participant's shoulder was exposed.
- The Roa-marx activity scale was developed by Brophy et al. 2005, and reliability and validity established.

RESULTS

Dependent Variable	Independent Variable	Sub group	Pearson's correlation			Simple regression analysis		
			r	p	interpretation	F	p	R^2
AHD with 0° arm abduction	Shoulder internal rotation	sportsmen	0.29	0.01	+ significant weak	7.41	0.01	0.08
	Pectoralis minor length	sportsmen	0.24	0.01	+ significant weak	8.79	0.01	0.06
AHD with 60° arm abduction	Pectoralis minor length	sportsmen	0.20	0.02	+ significant weak	5.78	0.02	0.04
% reduction AHD	Total arc of rotation	controls	0.32	0.01	+ significant weak	6.74	0.01	0.09
	Shoulder external rotation	controls	0.39	0.01	+ significant weak	10.95	0.01	0.15
	Shoulder activity level	controls	0.40	0.01	+ significant moderate	8.70	0.01	0.16
	Shoulder activity level	sportsman	minus 0.54	0.01	- significant moderate	14.55	0.01	0.29

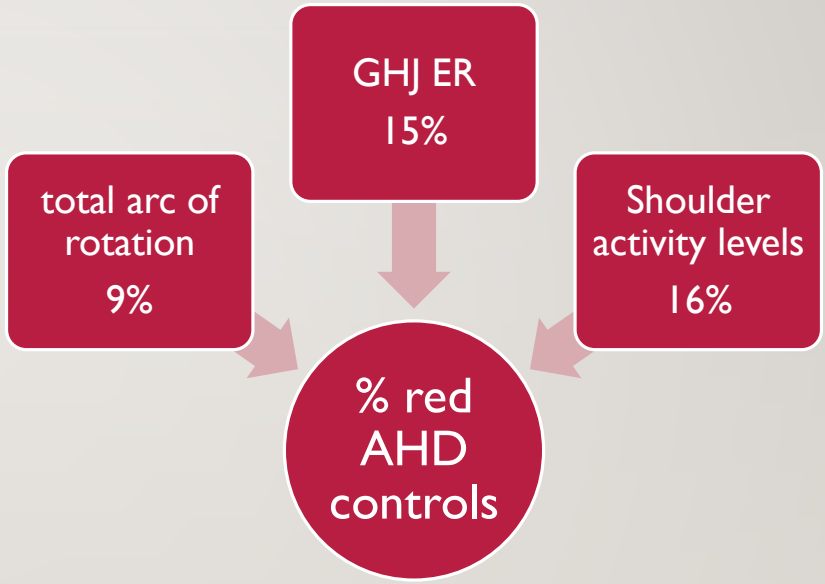
Table 2. Results of Pearson's correlation and simple liner regression analysis. Abbreviations: AHD = acromio-humeral distance; % = percentage; °= degrees; + = positive; - = negative.

RESULTS – LINEAR REGRESSION ANALYSIS

AHD 0° sports
- Shoulder internal rotation 8%
- Pectoralis minor length 6%

AHD 60° sports
- Pectoralis minor length 4%

% red AHD sports
- shoudler activity level 29%



CLINICAL IMPLICATIONS

- Because GERG and increase in total arc of rotation in the shoulder are associated with a greater % of reduction in AHD in controls – indicate dynamic control of GHJ rotations to maintain AHD.
- Dynamic balance in M activity between pectoralis minor and its agonist muscle groups is important in AHD maintenance.
- GIRD must be addressed to avoid reduction in AHD

NOTE:

- Monitoring of load and shoulder activity levels is important because the % reduction in AHD was influenced by this.
- And as such should be considered as a separate risk factor in SA pain syndrome.

CONCLUSION

- These findings support the assertion that extrinsic factors and *the strength* of influence on AHD appear to be multifactorial and the strength of the relationship was *population specific* and *dependant on arm position*.

FURTHERMORE

- Relationships only accounted for small variances in AHD indicating that in addition to these factors there are other factors involved in determining AHD.

COMBINATION OF FACTORS – PEC +GHJROM+ SH ACTIVITY

- Multiple linear regression

group	Dependant variable	Correlation r=	Variance attribute	
Male control	AHD neutral	0.42	17%	
	AHD 60 abd	0.35	12%	
	% reduction AHD	0.60	36%	

ETC……
…….

LIMITATIONS

- Compromise of subacromial space cannot be totally quantified by measure of AHD alone
- range of arm elevation in which the US measure of AHD is possible is limited to a maximum of 60°. Although the AHD is reported to be at its smallest at 60 degrees of abduction. To what extent the relationship between variables and AHD can be extrapolated in higher ranges of arm elevation is unclear.
- Asymptomatic subjects were used in this study; thus, a direct relationship between impairment cannot be assumed.
- All athletes were assessed during tournament or training camps and measures of variables may vary over the course of a season [11,12]

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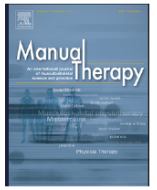

Original article

Relationship between extrinsic factors and the acromio-humeral distance

Tanya Anne Mackenzie [a, *], Lee Herrington [b], Lenard Funk [c], Ian Horsley [d], Ann Cools [e]

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THANK YOU

Relationship between extrinsic factors and the acromio-humeral distance.
Mackenzie TA, Herrington L, Horsley I, Funk L, Cools A.

Research Presentation:
Background: Maintenance of the subacromial space is important in impingement syndromes. Research exploring the correlation between biomechanical factors and the subacromial space would be beneficial.
Study purpose: To establish if relationship exists between the independent variables of scapular rotation, shoulder internal rotation, shoulder external rotation, total arc of shoulder rotation, pectoralis minor length, thoracic curve, and shoulder activity level with the dependant variables: AHD in neutral, AHD in 60° arm abduction, and percentage reduction in AHD.
Methods: Data from 72 male control shoulders (24.28years STD 6.81 years) and 186 elite sportsmen's shoulders (25.19 STD 5.17 years) were included in the analysis. The independent variables were quantified and real time ultrasound was used to measure the dependant variable of acromio-humeral distance.
Results: Shoulder internal rotation and pectoralis minor length, explained 8% and 6% respectively of variance in acromio-humeral distance in neutral. Pectoralis minor length accounted for 4% of variance in 60° arm abduction. Total arc of rotation, shoulder external rotation range, and shoulder activity levels explained 9%, 15%, and 16% to 29% of variance respectively in percentage reduction in acromio-humeral distance during arm abduction to 60°.
Discussion: Pectorals minor length, shoulder rotation ranges, total arc of shoulder rotation, and shoulder activity levels were found to have weak to moderate relationships with acromio-humeral distance. Existence and strength of relationship was population specific and dependent on arm position. Relationships only accounted for small variances in AHD indicating that in addition to these factors there are other factors involved in determining AHD.

The influence of gender on the incidence and recovery from shoulder instability on high school athletes.

McDevitt H, Shanley E

Research Presentation:

Background: Shoulder instability is a common problem in high school athletes, both male and female. These injuries can be season ending for these athletes and in some cases can put an end to their participation in sports. The purpose of this study was to examine the incidence and resolution of shoulder instability episodes in a cohort of high school athletes.

Methods: 181 student athletes who sustained an episode of shoulder instability participated in this study. All athletes were participating on an official HS athletic team and injured during an official practice or competition. Athletes with shoulder instability were referred to a tertiary care orthopedic practice after screening and examination by athletic trainer. Athletes ranged in age from 12-18 years of age (males averaged 16.1 +/-1.3 years vs females 14.9 +/-1.4years). All athletes followed received standard non operative care and were evaluated for their ability to return to sport in the subsequent season. Chi square analyses were used to determine the significance of sport, treatment, and injury type by gender.

Results: There was no significant difference between direction($p=0.28$) or episode (1st time disclocation) by gender($p=0.17$). There was a trend toward more males with shoulder instability returning to the next season of sport of injury compared with females ($P= 0.06$).

Discussion: This study examined the rate of shoulder instability injuries in male vs female high school athletes, and their trends toward return to sport the following season. Female athletes with shoulder instability tended to return to sport at a lower frequency than male athletes. This raises the question of the potential differences in goals or treatment associated with female athletes in this cohort. Future studies should be undertaken to verify these findings.

Observational Scapular Dyskinesis: Is it relevant?

Michener LA, Plummer HA, Pozzi F, Varghese R, Sum JC: Division of Biokinesiology and Physical Therapy, University of Southern California, Los Angeles, CA.

Research Presentation:
Background: Altered position and movement of the scapula, defined as scapular dyskinesis, has been implicated as a cause of shoulder pain. However, it is unclear if scapular dyskinesis is a common finding, or indeed more prevalent in those with shoulder pain. Understanding of the relevance of observational scapular dyskinesis can enable our use during clinical examinations and patient care.
Purpose: To determine the prevalence of scapular dyskinesis in participants with and without shoulder pain, and to determine if this prevalence is affected by knowing if the participant has shoulder pain by using blinded and unblinded examiners.
Design and Setting: Prospective cohort; outpatient physical therapy clinic.
Participants: Participants (n=135); n=67 with shoulder pain (32.5±12.4 years, 33 females, 53 dominant-shoulder); n=68 healthy controls (27.8±8.7 years, 41 females, 54 dominant-shoulder).
Methods: Participants underwent the scapular dyskinesis test (SDT) described by McClure et al (2009). Participants were tested by 2 examiners, who were clinicians who underwent on-line and in-person training for performance of the SDT. The first examiner consented the participant and performed the SDT (unblinded examiner), and the second examiner then performed a SDT without feedback from the participant (blinded examiner). The SDT assessed for observational scapular dyskinesis during weighted active flexion and abduction. Dyskinesis was rated as normal, subtle, or obvious for winging or dysrhythmia. For data analysis, normal was classified -dyskinesis, while subtle and obvious defined +dyskinesis.
Results: There were no significant differences between the shoulder pain and control groups for the prevalence of dyskinesis during SDT in abduction (p=0.092) or flexion (p=0.512). Participants with shoulder pain and the healthy control group respectively had dyskinesis of 45/67(67.2%) and 42/68 (61.8%) during flexion SDT, and 45/67(67.2%) and 36/68(52.9%) during abduction SDT. Comparisons of prevalence between the blinded and unblinded examiners revealed no significant differences for flexion (p=0.166) or abduction (p=0.110) SDT. Blinded examiners and unblinded examiners respectively reported dyskinesis of 45/65(67.7%) and 51/65(78.5%) during flexion SDT, and 44/65(67.7%) and 52/65(80.0%) during abduction SDT.
Discussion: Prevalence of scapular dyskinesis with the SDT does not appear to be influenced by the presence of shoulder pain, or knowing if the individual has shoulder pain or not. It should be noted that participants with pain were not classified by diagnosis; dyskinesis prevalence may be influenced by a diagnosis such as instability.
Clinical Application: Altered scapular motion was observed in participants with shoulder pain as well as healthy controls. Thus, the presence of scapular dyskinesis is likely not related to shoulder pain. Future research is needed to determine if other tests such as the scapular reposition and assistance tests, as well as scapular muscle performance and length tests can effectively delineate if scapular dysfunction is influencing shoulder pain and functional loss in patients with shoulder dysfunctions.

Rehabilitation of the Rotator Cuff: Eccentric Loading as the Primary Treatment of Rotator Cuff Tendinosis.

Reg B. Wilcox lll, PT, DPT, MS, OCS: Clinical Director, Ambulatory Rehabilitation Services, Department of Rehabilitation Services, Brigham & Women's Hospital, Boston, MA

Educational Topic Presentation:

The successful management of a painful intact cuff tendon in the presence of tendinosis can often be a challenging clinical condition for even the most skilled therapist or orthopedic surgeon. Eccentric loading of the rotator cuff with tendinosis is a logical treatment option based on positive results noted in the literature for the successful management of other tendons that are plagued with tendinosis. However, minimal quality literature exists outlining the impact of eccentric loading on the management of the rotator cuff.

In multiple human studies, eccentric loading has proven most effective, especially in the Achilles tendon[1-4]. Silbernagel et al showed that patients in an eccentric training program experienced increased range of motion, reduction in tendon swelling, and an overall increase in patient satisfaction compared to the control[5]. Patients involved in an eccentric loading in a study by Roos et al reported a significant reduction in pain compared to the control[6]. Fahlstrom et al found that an eccentric strengthening helped quickly return patients to a pre-injury recovery level[7].

Eccentric strengthening has been shown to be effective in the rotator cuff. Ellenbecker et al studied the torque involved in the overhead tennis serve and showed that eccentric training produced a greater increase in concentric strength[8]. These results were later reproduced in a similar overhead study in which an eccentrically trained group showed significantly greater increases in peak force and torque of the rotator cuff [9].

Noffal expressed his conviction that a rehabilitation program focusing on eccentric loading would greatly improve strength and prevent future injury of the rotator cuff, especially in overhead athletes[10]. However, while the rotator cuff has been shown to benefit from eccentric loading, to our knowledge there have been no studies conducted which investigate the merits of a rehabilitation program focused on eccentric strengthening as a method of conservative treatment of rotator cuff tendinosis.

The purpose of this presentation is to outline an eccentric loading program for the management of rotator cuff tendinosis based on principles established in the literature for the eccentric management of other tendons with tendinosis. In addition, a retrospective case series analysis of clinical outcomes to support such an eccentric program for the management of rotator cuff tendinosis will be presented.

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Validation of a Clinical test for Subtle Posterior Shoulder Instability

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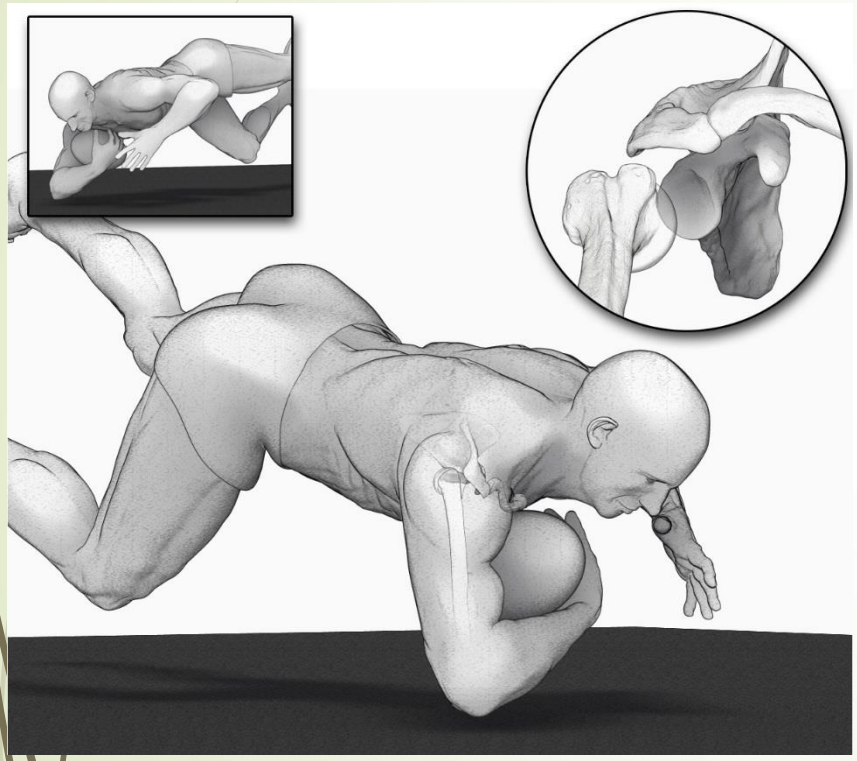
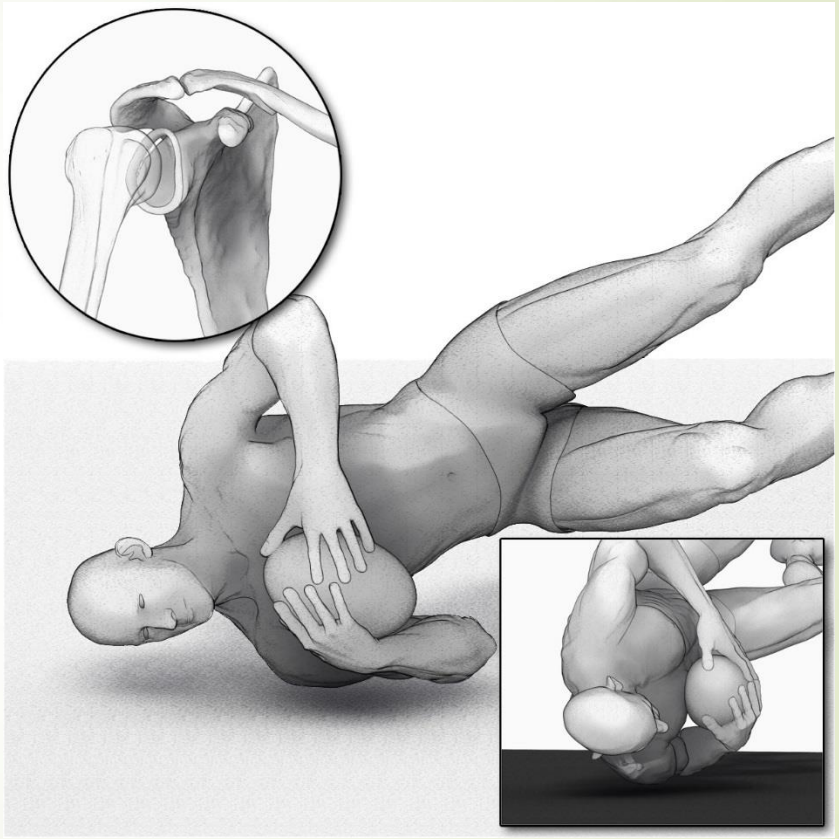
POSTERIOR INSTABILITY

- Posterior instability is a relatively rare condition in the shoulder
- Posterior instability can often be overlooked or missed – may be due to difficulties in preoperative diagnosis

MOI





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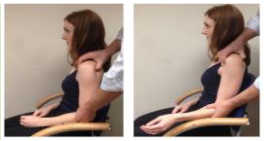
TRADITIONAL TESTS

		Specificity	Sensitivity	Notes	Reference
Posterior Drawer Test				No data	
Load & Shift		100%	14%	For Laxity	Gerber & Ganz. JBJSB. 1984
Posterior Apprehension		99%	20%		Jia et al. JBJSA. 2009
Jerk Test		85%	90%	posteroinf. labral tear	Kim et al. AJSM. 2004
Kim Test		95%	80%	posteroinf. labral tear	Kim et al. CORR. 1993

- The Jerk Test has only been shown to be selective in detecting a postero-inferior labral lesion

- None of the others have been shown to have good clinical diagnostic value

REINTERPRETATION OF THE O'BRIEN'S TEST

- **Conducted in the same manner to that initially described by O'Brien**

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- The test is considered positive with **objective weakness** observed by the examiner when downward force on the arm resulted in loss of forward flexion from 90°.

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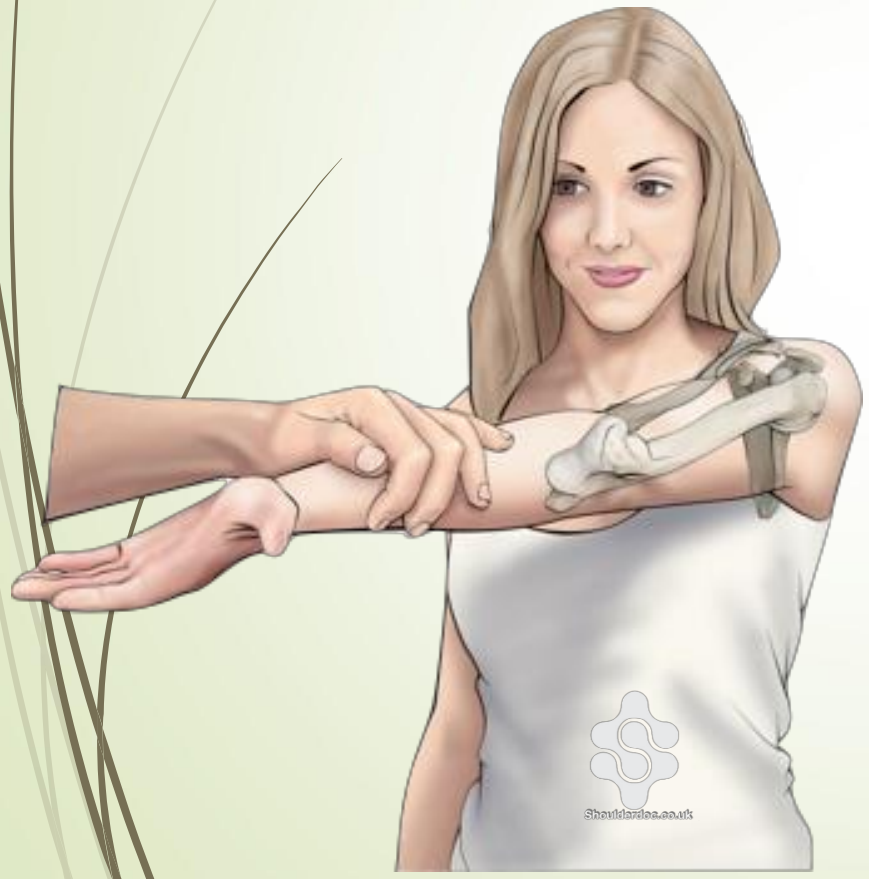
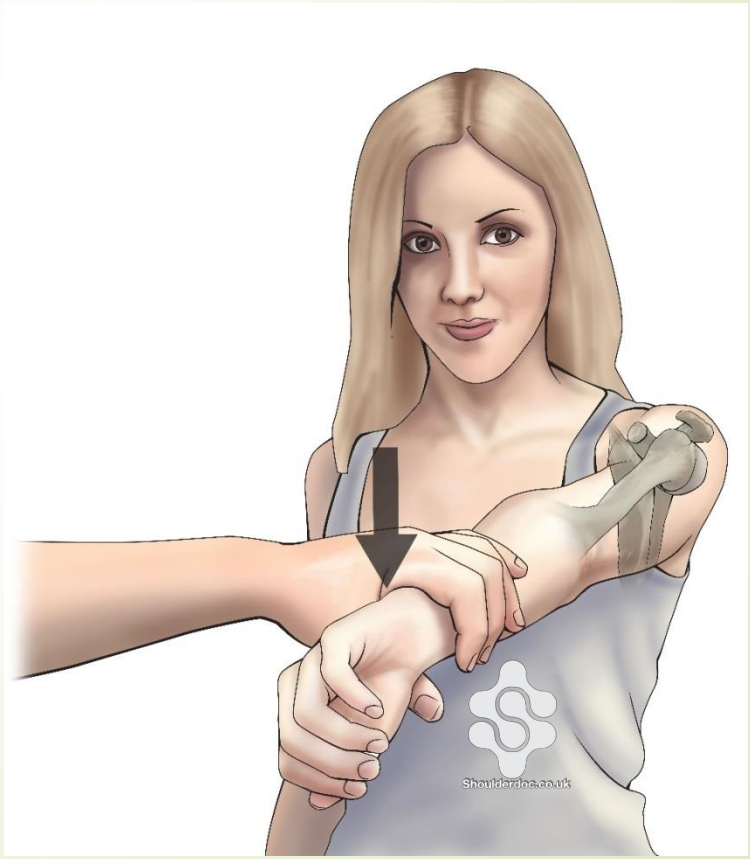
REINTERPRETATION OF THE O'BRIEN'S TEST

MECHANISM: tighten post capsule/line of pull of deltoid →posterior translates HOH/stress the labrum/abnormal loading results in pain and weakness





AIM

- How sensitive and specific is the test at correctly diagnosing posterior instability?

METHODS

- Retrospective study
- 74 patients seen over a 3 year period with traumatic instability
- All clinical tests recorded.
- The imaging and surgical findings were then recorded and compared to the clinical test findings
- Patients with surgical findings consistent with a diagnosis of posterior instability and a positive reinterpreted test formed the true positive group and vice versa

RESULTS

Owen, Mackenzie, Boulter, Funk, 2015

- Included All arthroscopic stabilisations, incl. anterior
- n = 74

	Post lesion present	Post lesion absent	
MOB +ve	55	6	PPV 90%
MOB -ve	11	2	NPV 15%
	Sensitivity 83%	**Specificity 25%**	N=74

DISCUSSION

- High sensitivity and PPV values shows that the test is accurate at detecting the presence of posterior instability
    - Unlikely to have a missed diagnosis, high confidence in your diagnosis.
- Low specificity and NPV values however mean that the test is unreliable in patients with no posterior instability
- Benefit is in conjunction with tests with high specificity (i.e. Posterior Apprehension test)

CONCLUSIONS

- Reinterpreting the O'Briens test could be used to help confirm a diagnosis of posterior instability and better guide management
- This could mean that this test in combination with more specific tests could be considered as a effective method of diagnosing posterior instability clinically
- Published

A physiological test

Musculoskelet Surg
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ORIGINAL ARTICLE

The Porcellini test: a novel test for accurate diagnosis of posterior labral tears of the shoulder: comparative analysis with the established tests

V. M. Morey[1] · H. Singh[3] · P. Paladini[2] · G. Merolla[2] · V. Phadke[4] · G. Porcellini[2]

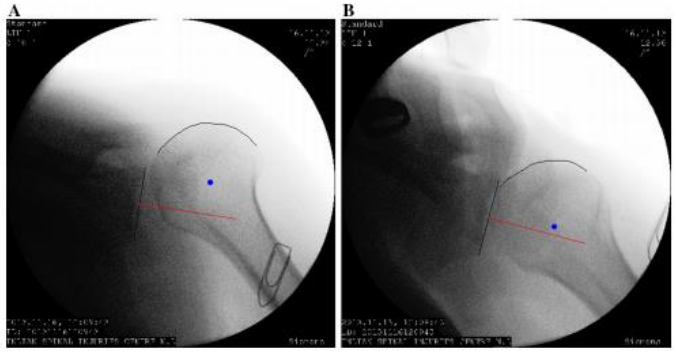

Fig. 2 Radiographic verification of the "Porcellini" test. **a** Posteriorly translated humeral head during first maneuver. **b** Posterior translation of humeral head prevented on account of the moderate anterior force exerted by the examiner's thumb during second maneuver. The blue dot represents the center of the humeral head, and the red line is perpendicular to the glenoid axis through its center

Thank you

Rehabilitation and return to play of a pole vaulter with bilateral shoulder instability and anterior chest wall pain.

Brooks, GP: Texas Children's Hospital/Baylor College of Medicine. Houston, TX. USA

Case Study Presentation:

Problem: Shoulder instability is a common disorder, yet there is a lack of evidence to guide decision making for physical therapy treatment and return to play for competitive athletes.

Patient(s) clinical presentation: a 15 yo female pole vaulter presented to physical therapy with complaint of R anterior chest wall pain, headaches, and bilateral shoulder instability symptoms. Bilateral shoulder multidirectional instability was evident upon active movement assessment and sulcus sign testing. Large volume myofascial trigger points (MTrP) were identified in the pectoralis major and these were productive of the familiar chest wall pain upon palpation.

Intervention(s): The MTrP were deactivated with deep dry needling techniques. Neuromuscular electrical stimulation (NMES) was used to obtain a muscular contraction of the scapular upward rotators in the absence of a volitional contraction. A Figure 8 clavicle fracture brace was used for 8 weeks to correct the postural dysfunction associated with muscular shortening of the pectoralis and latissimus dorsi muscles. Referral for consultation with sports dietetics and pain management services were made. Therapeutic exercise initially consisted of low-intensity Isometric exercises for the shoulder below subluxation threshold. Strengthening exercises for the shoulders were progressed to isotonic resisted exercise for the trapezius muscle, the serratus anterior muscle, and shoulder external rotators. Activities to enhance shoulder proprioception and stabilization were performed. In the late phase of rehabilitation shoulder strengthening exercises were performed in flexion, protraction, and extension.

Outcomes Measures: Outcome measures were recorded at monthly intervals for 9 months. Strength was measured using a hand held dynamometer for peak force measured in newtons. Strength improved in shoulder flexion from 71 N to 102 N, in shoulder abduction from 72.5 N to 107.6N, in IR from 43.14N to 87.6N, and in ER from 37.3 to 80 N. Strength was improved in the Middle Trapezius from 45.37 N to 193.94N and in the Lower Trapezius from 86.29N to 151.23 N. Self-reported functional status was measured using the Upper Extremity Functional Scale (UEFS) The Upper Extremity Functional Scale score improved from 29/ 80 to 80/80. Upon discharge the patient returned to pole vaulting and set a personal best record.

Discussion/Clinical application: This case provides descriptive information regarding short-term and mid-term outcomes for a patient with bilateral shoulder instability treated in physical therapy. This case study demonstrates one example of a successful, data-informed course of rehabilitation and return to play. This case may help guide clinicians in the treatment and return to play of athletes with similar injuries.

The Modified O'Brien test for posterior labral tears of the shoulder.

Tanya Anne Mackenzie, PhD

Educational Topic Presentation:

Abstract: Injuries to the posterior labrum are less common and more difficult to diagnose compared to anterior labral pathology. This may be in part due to difficulties in preoperative diagnosis. Posterior labral injuries cause abnormal loading of the rotator cuff with subsequent weakness. Examination using the O'Briens test tightens the posterior capsule and posteriorly translates the humeral head, stressing the labrum resulting in pain and weakness. We did a retrospective study of 74 patients in our clinic diagnosed with a posterior labral tear at arthroscopy 55 had subjective weakness on performing a O'Briens test (sensitivity of 83% and a positive predictive value (PPV) of 90%). Multiple tests have been described for posterior labral pathology and none of these, on their own, have a high sensitivity rate. Posterior labral injuries can often be missed on magnetic resonance imaging scanning and also at surgery if not specifically looked for. Using a sign of clinically demonstrated weakness when performing the O'Briens test, and hence reinterpretation of the test, is sensitive, with a high PPV for posterior labral pathology and can help guide further treatment. Videos to demonstrate the reinterpretation of the test to illustrate this can be shown.

Shoulder instability: It's all in your head.

Michael A. Shaffer PT, ATC, OCS

Educational Topic Presentation:

For the treatment of shoulder instability, there are 2 seemingly indisputable facts: patients who have suffered a traumatic shoulder dislocation have a more positive outcome with surgical stabilization while patients with atraumatic shoulder instability will respond positively to rehabilitation. But are we being naïvely overconfident in our understanding of shoulder instability?

Arthur Bankart described a lesion of the anterior-inferior capsulolabral complex as the "essential lesion". Yet, cadaveric studies have demonstrated that sectioning of the anterior-inferior labrum in isolation does not produce a spontaneous subluxation of the humeral head even in positions of abduction and external rotation(Apreleva et al., 1998). Not surprisingly, once the structures have been sectioned, there is an increase in anterior translation of the humeral head(Speer et al., 1994). But have we falsely equated an increase in passive translation to untreatable shoulder instability?, an increase in translation that comes about only when 1) the force is directly applied , 2) while the labrum and anterior capsule has been sectioned, 3) while there is no associated muscle activity. The fact that there are differential outcomes for patients with traumatic instability based upon patient age seems to suggest that it is not the lesion itself, but rather the inability to counteract the stresses of the activities in which one engages(Hovelius & Rahme, 2016). Indeed, eliminating overhead sports dramatically reduces the recurrence rates for shoulder instability(Kuroda et al., 2001). Rather than asking an athlete to scale back their sport, we should try to optimize rehabilitation to help patients better withstand the stresses of sport. But although it is broadly accepted that rotator cuff activation exercises are a primary component of rehabilitation, the mechanism by which the rotator cuff provides control of shoulder instability is not completely understood. Does the RC function as a feedforward stabilizer contracting en masse to provide stability prior to contraction of the primary movers(David et al., 2000)? Does the overall contraction of the rotator cuff serve as a method for concavity compression pulling the humeral head into the glenoid enhancing the bony conformity of the shoulder(Lee et al, 2000)? Or does rotator cuff training result in enhanced control in response to unexpected events(Day, Taylor, & Green, 2012)? And if it is the case that neuromuscular training results in improved stability, is it because of an up-regulation of posterior rotator cuff control or a reduction of pectoralis major activity? On this last fact, authors have demonstrated that hyperactivity of the pectoralis major can produce a force which destabilizes the Bankart lesioned subject(McMahon & Lee, 2002). In this way is the typical athlete with traumatic shoulder instability, a young athletic male with well-developed pectoral muscles, similar to the athletic female who has spent years developing quadriceps strength, but is now at increased risk for ACL rupture because of a hyper-active reflexive response(Shultz et al., 2001).

Largely based upon a single study, atraumatic shoulder instability is believed to reliably improve with conservative rehabilitation(Burkhead & Rockwood, 1992). Supporting this argument is the fact that these individuals do not have an anatomic lesion per se. Yet,

individuals with atraumatic instability demonstrate changes in reflex level responses which may leave them just as vulnerable to injury as those with a defined anatomic lesion(Augé & Morrison, 2000). We assume that our current methods of rehabilitation are the explanation for the clinical improvements yet rehabilitation alone does not restore normative patterns of motion(Kiss, Illyes, & Kiss, 2010; Nyiri, Illyes, Kiss, & Kiss, 2010). Furthermore, longitudinal studies of patients with atraumatic instability indicates that many elect surgical stabilization and those who continue conservatively have outcomes which are less than optimal. Further complicating the issue is that few patients are still performing their prescribed exercises at final follow up(Misamore, Sallay, & Didelot, 2005). This lack of compliance perhaps indicates patients find the exercises monotonous, unhelpful, or unengaging.

Finally, of all the special tests for the shoulder, perhaps none is used as commonly as the anterior apprehension test(Sciascia, Spigelman, Kibler, & Uhl, 2012). A positive apprehension test nicely fits our preconceived notion of the lack of an anterior stabilizing restraint. Interestingly though, subjects who had previously suffered a traumatic dislocation were more likely to report apprehension after being pre-conditioned by watching a video of a subject who sustained a shoulder injury as opposed to watching a benign video. Furthermore, subjects who watched the injury video demonstrated increased activity in regions of the brain associated with anxiety and fear(Haller et al., 2014). Are we really testing for shoulder instability or whether the patient has a negative memory of being injured in a 90/90 position(Shitara et al., 2015). Put another way, examining and treating shoulder instability may really be all about the central nervous system, for both clinician and patient.