Journal of Rheumatology Research
JRR, 2(1): 75-80
www.scitcentral.com

ISSN: 2641-6999

Review Article: Open Access

# A Clinical Reasoning Algorithm for Screening the Subacromial Impingement Syndrome

**Thiruvarangan S[1*], Narani A[2] and Shaminy T[3]**

[*1]*Department of Physical Medicine, Base Hospital, Point Pedro, Jaffna, Sri Lanka*

[2]*Department of Rheumatology and Rehabilitation, Teaching Hospital, Jaffna, Sri Lanka*

[3]*Department of Physical Medicine, Teaching Hospital, Jaffna, Sri Lanka.*

*Received September 11, 2019; Accepted September 26, 2019; Published January 07, 2020*

## ABSTRACT

Shoulder pain and dysfunction are most common collective musculoskeletal illness in the overall population and seeking care from physical medicine and rehabilitation. Impingement is a frequently described pathological condition, which possibly the result of scapular dyskinesis, muscle dysfunction and shoulder instability and consequently leads to rotator cuff and biceps pathology eventually becoming chronic stiffness adhesive capsulitis. Number of different shoulder tests have been enlightened in literature and claimed with their individual diagnostic accuracy. However, it is often challenged for the clinician to select the appropriate tests for differential diagnosing the underlying pathology because the shoulder pain's symptomatology findings are various and overlapped each other however, a successful outcome of shoulder pain is dependent on precise differential diagnosis. It is attained by the systematic clinical diagnosis approach. The purpose of this paper is to talk over a clinical algorithm which would be applied in the early detection of the underlying causes of impingement symptoms. In this algorithm, a specific chronology and selection of diagnostic tests may offer the clinician a guideline in his physical examination of the patient with shoulder pain.

**Keywords:** Sub acromial impingement syndrome (SIS), Shoulder pain, Coracoacromial ligament

## INTRODUCTION

Shoulder pain due to subacromial Impingement Syndrome (SIS) is the most prominent reason. SIS is that the soft tissue entrapping in the sub acromial space, which is built by the under the surface of the acromion, head of humerus and coracoacromial ligament. SIS is caused by various factors resulting from impingement on the rotator cuff tendon, the long head of biceps and occasionally the overlying subacromial bursa and superior portion of capsule against the anterior edge of the acromion and its' associated coracoacromial arch. Pain is located around the acromion and lateral side of the upper shoulder. It is exaggerated by overhead physical activity and pain getting worse at night. In the majority of cases, the prevalence of shoulder pain and rotator cuff dysfunction get severe with aging among women population. The shoulder pain symptomatology can be overlapped by many findings and various conditions however, successful prognosis in related to sub acromial impingement syndrome is dependent on precise diagnosis. It can be brought by detailed knowledge of the regional anatomy, the biomechanics of shoulder motion and the accurate interpretation of the pathology determined through a detailed history, comprehensive physical examination and diagnostic studies. A study reveals that conservative interventions approach for shoulder impingement syndrome recovery of the problem in 70-90% of cases [1].

## PATHOPHYSIOLOGY OF SUBACROMIAL SYNDROME

The subacromial space is superiorly designed by the anterior edge and bottom of the anterior third of the acromion, coracoacromial ligament and the acromioclavicular joint and inferiorly the humeral head. The soft tissues that occupying in the sub acromial space are supraspinatus, long head of the biceps brachii tendon, subacromial bursa and the superior portion of the capsule. One or all of these soft tissues may be affected by the narrowing of sub acromial space. The main pathology is inflammation and degeneration of the under-

**Corresponding author** S Thiruvarangan, Clinical Physiotherapist, Department of Physical Medicine, Base Hospital, Point Pedro, Jaffna, Sri Lanka, Tel:+94778470824; E-mail: t.ranga13@gmail.com

**Citation:** Thiruvarangan S, Narani A & Shaminy T. (2020) A Clinical Reasoning Algorithm for Screening the Subacromial Impingement Syndrome. J Rheumatol Res, 2(1): 75-80.

lying soft tissues occurs as a consequence of mechanical compression under sub acromial space. Based on significant advancement research in the areas of anatomy and biomechanics of the human shoulder has led to classification of the shoulder impingement into external and internal. External impingement is the mechanical encroachment of the soft tissue in the sub acromial space between the humeral head and the acromial arch. This encroachment particularly takes place in the midrange of motion, often causing a "painful arc" during active abduction [2]. Internal impingement comprises encroachment of the rotator cuff tendons between the humeral head and the glenoid rim. Based on the location of the impingement, anterosuperior and poster superior glenoid impingement have been described. Moreover, poster superior glenoid impingement is most common and it consists of the mechanical encroachment of the rotator cuff tendons, particularly the tendon of the supraspinatus and infraspinatus between the greater tubercle of the humors and the postero superior rim of the glenoid. This friction occurs specifically during the maximal external rotation, horizontal abduction [3].

Besides the classification of impingement based on the location of encroachment, very often impingement is classified by the cause of the problem, dividing it into primary versus secondary impingement [4]. In primary impingement, a structural narrowing of the subacromial space causes pain and dysfunction, such as acromioclavicular arthropathy, type I acromion or swelling of the soft tissue in the sub acromial space. In secondary impingement, there are no structural obstructions causing the encroachment, but rather functional problems, occurring such as scapula dykinesis. Secondary impingement may occur in the sub acromial space as well as internally in the glen humeral joint [5]. In view of the hypothesis that impingement symptoms would be the result of various underlying ongoing pathologies, thus it is important to describe the biomechanical relationship between these symptoms and shoulder diagnosis. Rotator cuff pathology may be associated with impingement symptoms in primary as well as secondary impingement. In primary impingement, swelling of the injured rotator cuff tendons causes the narrowing of the sub acromial space on the other hand in secondary impingement due to rotator cuff dysfunction because rotator cuff muscles perform a caudal glide arthrokinematic joint play motion of the humeral head during elevation in order to avoid impingement but in the case of rotator cuff muscles dysfunction more cranial migration of the humeral head, thus causing secondary impingement [6].

Scapular dyskinesis also has been well clarified in relation to impingement symptoms the rationale behind this association is that, during arm elevation, impingement may occur the insufficient scapula humeral rhyme motion because lack of muscular function, which support upward rotation, posterior tilting, and external rotation of scapular subsequently clearance the sub acromial space to follow glen humeral joint play motion [7]. The association between impingement symptoms and shoulder instability is well established excessive humeral head translations, based on capsular laxity and instability lead to narrowing of the sub acromial space or the glenohumeral joint relation, thus causing to impingement symptoms and pain [8]. Since the biceps plays an important role in shoulder stability and function, therefore biceps pathology causes secondary impingement symptoms. Indeed, biceps tendon problems (tendinopathy or tenosynovitis) as well as SLAP lesions (labral lesions at the site of origin of the long head of the biceps) compromise optimal shoulder function, and may result in impingement [4]. Glen humeral Internal Rotation Deficit is often referred to as GIRD there are several theories concerning the occurrence and development of GIRD. Burkhart et al. [8] report that GIRD takes place due to the contracture of the posterior capsule this interrupting glenohumeral arthrokinematic motion. Other researchers believe that GIRD begins in the early years with a bony adaptation of the humerus or muscle hypertony in the external rotators due to frequent eccentric loading [9].

**Clinical reasoning in patient investigation**

After gaining the medical history, a comprehensive physical examination should be carried if clinician suspects the impingement pain. It contains observing posture, soft-tissue inspection, palpation, active; passive range of motion, strength testing, neurologic assessment. It is vital that the clinician investigates the impingement the patient involves, and find out the underlying pathology. This paper emphasis on the algorithm offers the clinician for approaching the specific tests that can be followed when screening the painful shoulder problems, and intends a particular chronology in the performance of the individual tests **(Figure 1)**.

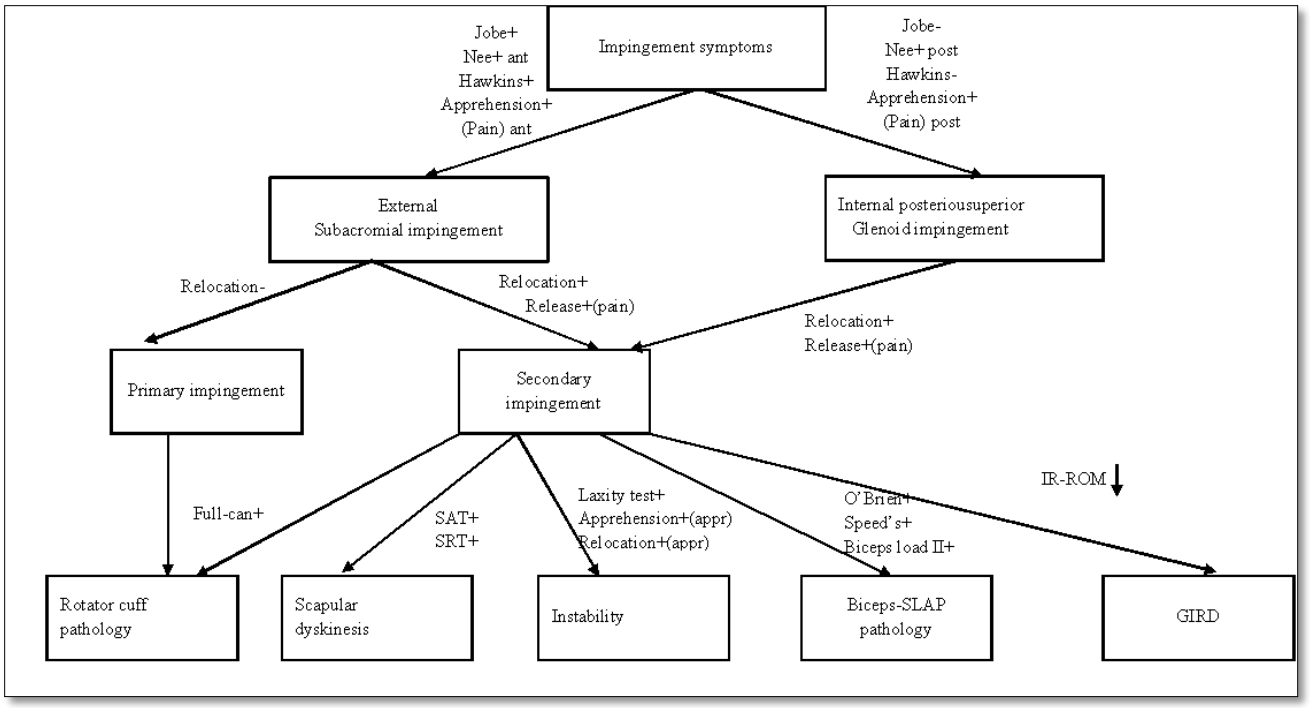


**Figure 1.** Algorithm for clinical reasoning in screening of sub acromial impingement shoulder [9,28].

## IMPINGEMENT TESTS

The most popular provocative impingement tests are the Jobe, Hawkins and Neer tests. The Jobe test is positive for subacromial impingement but the test will be negative if the patient has posterio-superior glenoid impingement. Interpretation of the Hawkins test is a suggestion for sub acromial impingement but the test will be negative in case of internal impingement. Painful Neer test depends upon the location of the pain if the pain at the front of the shoulder is a sign for subacromial impingement; whereas pain exhibits at the posterior aspect of the shoulder will be internal impingement. Beyond these impingement tests, the instability tests are very often applied as provocation tests for impingement [10]. Scholars interpret the Apprehension test and the Relocation test in relation to pain rather than instability symptoms in order to further outline the cause of impingement. Pain during the Apprehension test at the anterior aspect of the shoulder will indicate sub acromial impingement, whereas pain at the posterior aspect implies posterio-superior glenoid impingement [11]. The Relocation test is done following to the Apprehension test, which is positive if the pain exhibits during apprehension. The Relocation test provides the chance us to differentiate between primary versus secondary impingement. If the test is positive it means that the impingement pain is secondary as a result of excessive anterior translation of the humeral head, but a negative test advocates primary impingement, which is not dependent on the arthrokinematic position of the humeral head [12,13]. Impingement tests are known to have high sensitivity, but rather low specificity. A study established from their extensive meta-analysis that sensitivity and specificity for the Neer test were 79% and 53%, respectively, and for the Hawkins test 79% and 59%, respectively. However, number of the studies investigates accuracy of these tests by considering rotator cuff tendon pathologies as a reference for sensitivity and specificity diagnosis. On the other hand, most studies confirmed that the sub acromial space narrowing during the Neer and Hawkins manoeuvre. In addition, Hegedus et al. [14] suggested that using the Hawkins test as a screen and the supraspinatus test may serve as a confirmatory test for impingement. These tests should only be used to confirm the presence of impingement symptoms also to identify the underlying pathomechanics. In the use of instability tests in the evaluation of impingement, a study claimed that the overall accuracy of the shoulder Relocation tests was less than 50% when the response of pain alone was considered and was higher than 80% when the response of Apprehension alone was considered. Based on their results, the authors advised the clinician not to use the criterion of pain in the interpretation of these tests. However, accuracy of this test was investigated in relation to the diagnosis of instability and not impingement [12]. In the clinical examination of impingement, investigators used the criteria “pain during apprehension and disappearance of pain during relocation”. Moreover, recently, Meister et al. [13] established a new test for internal impingement, “the posterior impingement sign”, the clinician may be advised to use the Apprehension position to detection and location of impingement symptoms.

**Rotator cuff tests**

To define the involvement of rotator cuff pathology in the impingement symptoms, a modified version of the Jobe test is a valuable tool. Indeed, Jobe et al. [15] described the test to investigate the integrity of the rotator cuff muscles, particularly the supraspinatus. However, based on this test one cannot define whether a painful test is the result of functional impingement rather than rotator cuff muscle dysfunction. Therefore, the examiner can perform the full-can test. Research has indicated that rotator cuff muscles are also highly active in this position [15]. If both tests are painful, rotator cuff pathology is present. If only the Empty-can test is painful and the Full-can is negative, the patient probably suffers from impingement symptoms, but not primarily related to rotator cuff pathology. In the presence of rotator cuff pathology, the examiner can perform a number of specific tests for the supraspinatus, subscapular is and infraspinatus [16]. Several studies have been carried to compare the effectiveness of Empty-can test and the Full-can test for diagnosing supraspinatus pathology or impingement and revealed that both testing positions can be used in diagnosing supraspinatus tears, however in general pain provocation is less in the Full-can position. Thus, it has been advised to perform the Full-can position in the detection of rotator cuff tears and the Empty-can test in the diagnosis of sub acromial impingement symptoms [17].

**Scapular involvement tests**

Scapular connection with shoulder impingement may be inspected by the Scapular Assistance Test (SAT) and the Scapular Retraction Test (SRT). In the SAT, scapular motion quality is scanned during this movement pain reduction comparing with non-assistance confirms scapular involvement in the shoulder impingement. The SRT evaluate scapular stability. The test is positive for scapular association pain present while in the Empty-can position but disappears during the SRT [18]. Besides anthropometric measurements of scapular orientation and clinical qualitative observation of scapular movement patterns, a few clinical tests have been introduced in literature. However, scapular tests have been recently established in the literature these investigation tools try to identify possible scapular involvement in relation to shoulder impingement pain. A study examined the inter-tester reliability of the SAT on patients with shoulder pain and concluded that the SAT possesses acceptable inter-rater reliability for clinical use. Another study evaluated apparent and absolute supraspinatus strength in patients with shoulder injury using the SRT. The study showed that apparent supraspinatus muscle weakness on clinical examination in symptomatic patients might be dependent on scapular position, since the patients showed a significant increase in scapular elevation strength during the SRT association with Jobe test compared with the normal Jobe test [19].

**Instability tests**

The clinical tests to observe shoulder instability are divided into provocative tests and laxity tests. But provocative tests such as Apprehension and Relocation test are commonly used for instability described earlier in this paper. In case of instability, subjects will display instability symptoms, such as apprehensive muscle tension, and subluxation, rather than pain. Differentiate the provocative tests from the laxity tests by assessing humeral translation in relation to the glenoid fossa. The Load and Shift test may be used for anterior laxity the amount of laxity is graded from 1 means translation of humeral up to the glenoid rim to 3 means subluxation without spontaneous reduction. The sulcus sign reveals inferior laxity. The posterior laxity is pronounced by the posterior subluxation test, which is considered to be positive if a clunk is felt [20]. Speer et al. [13] examined the accuracy of the Apprehension and Relocation tests with respect to diagnosing instability. In this study high accuracy was found (85%) if the criterion was “apprehension” or reflexive muscle reaction to protect the glenohumeral joint, but rather low accuracy (49%) if the criterion was only pain. However, as mentioned earlier, in this study instability was the only target diagnosis, and not pain based on impingement. Meister et al. [12] found high sensitivity (75%) and specificity (85%) for the “posterior impingement sign” in which the shoulder is placed in a position similar to the apprehension position for diagnosing posterosuperior glenoid impingement. With respect to the laxity tests, a reliability of 0.75 was found for translations of the humeral head in anterior, posterior and inferior positions, when grading the amount of translation from I to III. In general, however, it is recommended to be cautious in interpreting laxity test results and to combine laxity testing with provocative instability testing in view of clinical reasoning and treatment determination [21].

**Biceps pathology and SLAP lesion tests**

The Speed’s Test, the O’Brien Test and the biceps load II test are recommend for biceps pathology and SLAP lesions based on recent literature. The Speeds test positive if pain produces into the biceps region. The SLAP lesions is examined by O’Brien test if pain is triggered in the first testing position, is diminished or vanished in the second testing position. The Biceps Load II test is considered positive if the patient complains of pain during the resisted elbow flexion [20,22]. In general, the Speed’s test is considered to be a non-specific but sensitive test for biceps and labral (SLAP) pathology. In recent literature, there is a tremendous interest in the question of how to diagnose with clinical testing the presence of SLAP lesions. Although a definitive diagnosis of SLAP lesions is typically made by arthroscopic observations, clinical suspicion is important before imaging study. However, symptoms in most patients with SLAP lesions are very often non-specific; patients often complain of clicking, “deep” shoulder pain, functional

instability and dead-arm syndrome. Various studies have been performed examining the diagnostic value of SLAP tests, with conflicting results. In a very recent paper, Oh et al. [23] examined the sensitivity, specificity and overall accuracy of SLAP tests, earlier described in literature. The authors concluded that some combinations of two relatively sensitive clinical tests (such as the O'Brien and Apprehension tests) and one relatively specific clinical test (such as the Biceps Load II test) increase the diagnostic efficacy of SLAP lesions. Based on this study, and taking into account the overall limited value of clinical SLAP tests, the above mentioned tests are integrated into the clinical algorithm for impingement-related shoulder pathology [23].

**Clinical evaluation of GIRD**

The assessment of GIRD is measured by glen humeral internal rotation range of motion. Goniometric assessment and interpretation of the "end-feel" are labeled as criteria for GIRD evaluation. A side difference of 20 degree is considered to be positive for GIRD [24]. In general, measurement of glenohumeral internal rotation ROM (supine, with the shoulder in 90 degree abduction) and assessment of horizontal adduction (side-lying) are suggested to indirectly evaluate stiffness of the posterior shoulder structures [25]. Therefore, these measurements should be performed with caution, and should be accompanied by thorough physical examination and interpretation of the end-feel during accessory movements such as posterior glenohumeral joint translation [26]. According to Riddle et al. [27], goniometric measurements for the shoulder are highly reliable when taken by the same physical therapist. The degree of inter-tester reliability for these measurements appears to be range of motion specific. Therefore it is advised that the same examiner performs both pre-treatment and post-treatment assessments [27].

## CONCLUSION

This article highlights the clinical screening algorithm to have differential diagnosis among painful shoulder problems because the greater understanding of the causes of impingement can lead to a more specific and non-generalised treatment approach to treat this disorder and consequently to regain pain free functional daily livings among the shoulder pain suffering population.

## REFERENCES


1. Morrison DS, Frogameni AD, Woodworth P (1997) Non-operative treatment of sub acromial impingement syndrome. J Bone Joint Surg Am 79: 732-737.
2. Neer CS II (1972) Anterior acromioplasty for the chronic impingement syndrome in the shoulder. A preliminary report. J Bone Joint Surg Am 54: 41-50.
3. Walch G, Boileau P, Noel E (1992) Impingement of the deep surface of the supraspinatus tendon on the poster superior glenoid rim: An arthroscopic study. J Shoulder Elbow Surg 1: 238-245.
4. Borsa PA, Laudner KG, Saurers EL (2008) Mobility and stability adaptations in the shoulder of the overhead athlete: A theoretical and evidence-based perspective. Sports Med 38: 17-36.
5. Hegedus EJ, Goode A, Campbell S (2008) Physical examination tests of the shoulder: A systematic review with meta-analysis of individual tests. Br J Sports Med 42: 80-92.
6. Blevins F (1997) Rotator cuff pathology in athletes. Sports Med 24: 205-220.
7. Kibler B (1998) The role of the scapula in athletic shoulder function. Am J Sports Med 26: 325-337.
8. Burkhart S, Morgan C, Kibler W (2003) The disabled shoulder: Spectrum of pathology part III: The SICK scapula, scapular dyskinesis, the kinetic chain and rehabilitation. Arthroscopy 19: 641-661.
9. Meister K (2000) Injuries to the shoulder in the throwing athlete. Part one: biomechanics/pathophysiology/classification of injury. Am J Sports Med 28: 265-275.
10. Tennent TD, Beach WR, Meyers JF (2003) A review of the special tests associated with shoulder examination. The rotator cuff tests. Am J Sports Med 31: 154-160.
11. Johanson MA, Gonzalez-King BZ (2004) Differential soft tissue diagnosis. In: Donatelli RA, ed. Physical therapy of the shoulder. New York: Churchill Livingstone.
12. Meister K, Buckley B, Batts J (2004) The posterior impingement sign: diagnosis of rotator cuff and posterior labral tears secondary to internal impingement in overhand athletes. Am J Orthop 33: 412-415.
13. Speer KP, Hannafin JA, Altchek DW (1994) An evaluation of the shoulder relocation test. Am J Sports Med 2: 177-183.
14. Hegedus EJ, Goode A, Campbell S (2008) Physical examination tests of the shoulder: A systematic review with meta-analysis of individual tests. Br J Sports Med 42: 80-92.
15. Jobe FW, Moynes DR, Brewster CE (1987) Rehabilitation of shoulder instabilities. Orthop Clin North Am 18: 47-482.
16. Takeda Y, Kashiwaguchi S, Endo K (2002) The most effective exercise for strengthening the supraspinatus muscle: Evaluation by magnetic resonance imaging. Am J Sports Med 30: 374-381.
17. Reinold MM, Macrina LC, Wilk KE (2007) Electromyographic analysis of the supraspinatus and

deltoid muscles during 3 common rehabilitation exercises. J Athl Train 42: 464-469.

18. Burkhart S, Morgan C, Kibler W (2003) The disabled shoulder: Spectrum of pathology part III: The SICK scapula, scapular dyskinesis, the kinetic chain and rehabilitation. Arthroscopy 19: 641-661.
19. Kibler WB, Sciascia A, Dome D (2006) Evaluation of apparent and absolute supraspinatus strength in patients with shoulder injury using the scapular retraction test. Am J Sports Med 34: 1643-1647.
20. Tennent TD, Beach WR, Meyers JF (2003) A review of the special tests associated with shoulder examination. Part II: laxity, instability and superior labral anterior and posterior (SLAP) lesions. Am J Sports Med 31: 301-307.
21. Park HB, Yokota A, Gill HS (2005) Diagnostic accuracy of clinical tests for the different degrees of sub acromial impingement syndrome. J Bone Joint Surg Am 87: 1446-1455.
22. Kim SH, Ha KI, Ahn JH (2001) Biceps load test II: A clinical test for SLAP lesions of the shoulder. Arthroscopy 17: 160-164.
23. Oh JH, Kim JY, Kim WS (2008) The evaluation of various physical examinations for the diagnosis of type II superior labrum anterior and posterior lesion. Am J Sports Med 36: 353-359.
24. Burkhart SS, Morgan CD, Kibler WB (2003) The disabled throwing shoulder: Spectrum of pathology: Part I: pathoanatomy and biomechanics. Arthroscopy 19: 404-420.
25. Myers JB, Laudner KG, Pasquale MR (2006) Glen humeral range of motion deficits and posterior shoulder tightness in throwers with pathologic internal impingement. Am J Sports Med 34: 385-391.
26. Ellenbecker T (2006) Shoulder rehabilitation: Non-operative treatment. New York: Thieme, p: 180.
27. Riddle DL, Rothstein JM, Lamb RL (1987) Goniometric reliability in a clinical setting. Shoulder measurements. Phys Ther 67: 668-673.
28. Cools AM, Cambier D, Witvrouw EE (2008) Screening the athlete's shoulder for pathology algorithm for early detection of shoulder impingement symptoms: A clinical reasoning. Br J Sports Med 42: 628-635.