

# **Epidemiology of Sport Injuries & Injury Prevention Strategies in Para Archery**

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PARALYMPIC  
COMMITTEE**



**Shadan Mohammadpour, Ph.D.**

**Corrective Exercises & Sports Injury Specialist**

**Director of Athletes Monitoring Department | I.R Iran National Paralympic Academy**

## Introduction

- > All sports carry an inherent risk of injury and this is **no different for Para sport**.
- > Injury rates in Paralympic sport are generally high with a trend towards **more injuries compared with sport for able-bodied athletes**.
- > Several reports emerging from the specific injury surveillance system implemented during the Paralympic Games 2012 have shown that **some injuries are similar to those in able-bodied athletes**.



- > Sports injury prevalence and incidence vary according to sports and population.
- > There is a need to reduce the occurrence and consequences of sports injury in order to allow **a healthy and sustainable sports participation**.
- > Due to the complex and **multifactorial nature of sports injury** makes its “prevention” / “reduction” difficult. It seems that sports injury is not the result of one unique cause but likely **the combination and interactions of several factors**.
- > One of the problems is that there is often **limited or no epidemiological information on which to base injury prevention strategies**.

## Introduction



- > **Patterns of injuries** in Paralympic athletes may be **different**.
- > The biomechanics of Para athlete injury are **specific** and **relate to impairment, level of competition, mechanism, anatomic area, and equipment-specific factors**.
- > The athletes may be exposed to **repetitive** and sometimes **improper biomechanical load in their daily life**.

## Para Archery



- > Adaptive archery is a sport of using a bow to propel arrows and emphasizes accuracy, concentration, and technique.
- > Archery demands strength and endurance in the shoulders, chest, and upper back. Muscles of core are instrumental for stabilizing the trunk and enable accurate aiming.
- > Ability to hold arm and bow in steady position for several seconds during aiming and release phase of shooting is critical for performance and it requires significant activity of rotator cuff muscles.

## Injuries in Para Archery

- > The literature on injuries associated with adaptive archery is scant, but extrapolation from nonadaptive archery suggests that it is a generally safe sport.

**Table II. Risk of injury in Paralympic sports**

Low risk sports	High risk sports
Archery	Cycling
Athletics	Equestrian
Boccia	Judo
Fencing	Soccer
Goalball	Wheelchair basketball
Powerlifting	Wheelchair rugby
Sailing	
Shooting	
Swimming	
Tennis	
Table tennis	

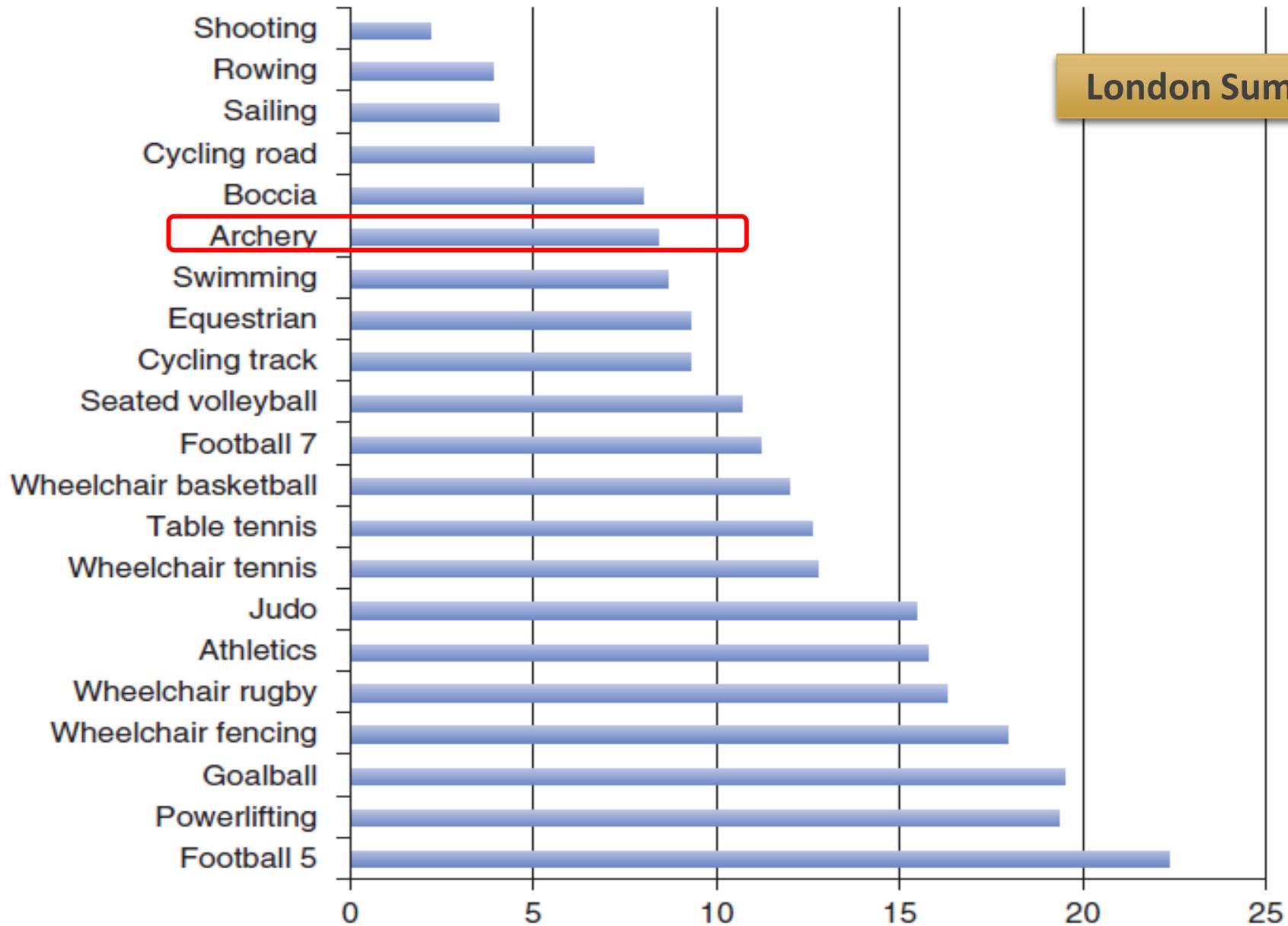
**Table 4: Incidence of injury by sport for athletes competing descending order of injury incidence rate**

**Rio 2016 Summer Paralympic Games**

<b>Sport</b>	<b>Total number of injuries (percentage of total number of injuries)</b>	<b>Number of athletes with an injury</b>	<b>Total number of athletes competing</b>	<b>Total number of athlete days</b>	<b>Proportion of athletes with an injury</b>	<b>Injury incidence rate: number of injuries/1000 athlete days (95% CI)</b>
Archery	16 (3.1%)	14	113	1582	12.4	10.1 (6.2 to 16.5)

The incidence of injury was lowest in canoe slalom, rowing, shooting, archery, swimming, golf and table tennis (ranging from 0 to 3 injuries per 100 athletes).

# Injuries in Para Archery



London Summer Paralympic Games 2012

## Injuries in Para Archery

The most common pain suffered by archers is

- > shoulder pain,
- > injuries to the hand,
- > forearm,
- > elbow,
- > fingers, and thumb.



## Injuries in Para Archery

London Summer Paralympic Games 2012

**Table 4** Number and onset of injuries by sport, as a proportion (%) of all injuries incurred in each sport

Sport	Number of injuries	Percentage of acute injuries	Percentage of acute or chronic injuries	Percentage of overuse injuries
Archery	15	33	20	47

Chronic injuries occur because of repetitive microtrauma, and are often referred to as “**overuse**” syndromes.

## Injuries in Para Archery

- training duration,
- technique,
- bow weight,
- number of arrows fired in a session,
- number of years spent in the game,
- age
- sex

are implicated as the risk factors for archery injuries.

**Table 2.4** Comparison of the level of evidence with purported archery-related risk factors.

Study	Level of Evidence	Number	Purported Risk Factor
Mann & Littke (1989)	III	21	Age, sex
Ertan & Tuzun (2000)	III	88	Training time, experience
Fukuda & Neer (1988)	IV	2	Technique
Shimizu et al. (1990)	IV	1	Technique
Rayan (1992)	IV	5	Technique
Naraen et al. (1999)	IV	1	Training time
Vogel & Rayan (2003)	IV	1	Technique

Level III = case-control study; Level IV = case series; Level V = expert opinion.

Archers are more likely to sustain an injury during **practice** rather than competition

## Injuries in Para Archery

- > **repetitive movement** of drawing and releasing the bow → **asymmetric forces** on the structure of shoulder girdle → the causative mechanism for archery related shoulder injuries
- > Repetitive concentric and eccentric loading of the muscles of shoulder girdle and upper back → fatigue and tendinitis of the surrounding muscles.
- > The prevalence of shoulder pain in archery → 7 % to 62.5%

## Injuries in Para Archery

- > **Shoulder pain** is perhaps the most common musculoskeletal complaint observed in wheelchair athletes. Frequently identified etiologies include **rotator cuff impingement or tear**, **biceps tendon pathology**, and **acromioclavicular joint pathology**.

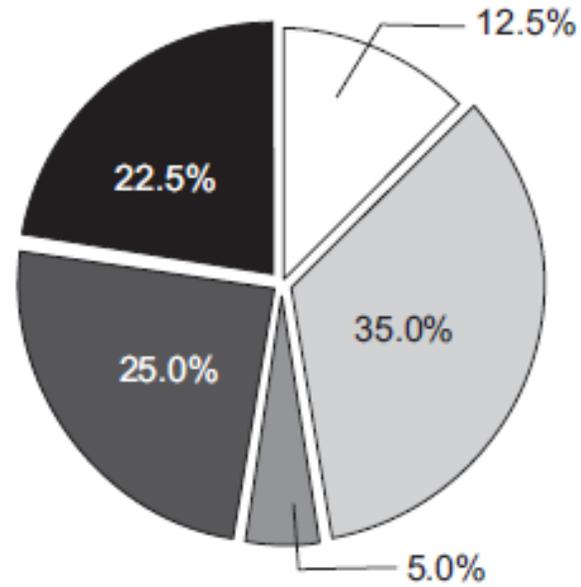
**TABLE 2.** Summary of Common Shoulder Pathology Found in Specific Wheelchair/Seated Sports

Wheelchair Sports	Shoulder Pathology Noted
Table-tennis <sup>62</sup>	Nonplaying arm—Subscapularis and supraspinatus tendinopathy Playing arm—subacromial bursitis
Archery <sup>62</sup>	Draw arm—biceps long head tendinopathy
Wheelchair basketball <sup>38</sup>	Rotator cuff tear
Wheelchair tennis <sup>43</sup>	Dominant shoulder—Acromioclavicular joint pathology, subacromial bursitis Both shoulders—rotator cuff tear, biceps tendon pathology

# Injuries in Para Archery

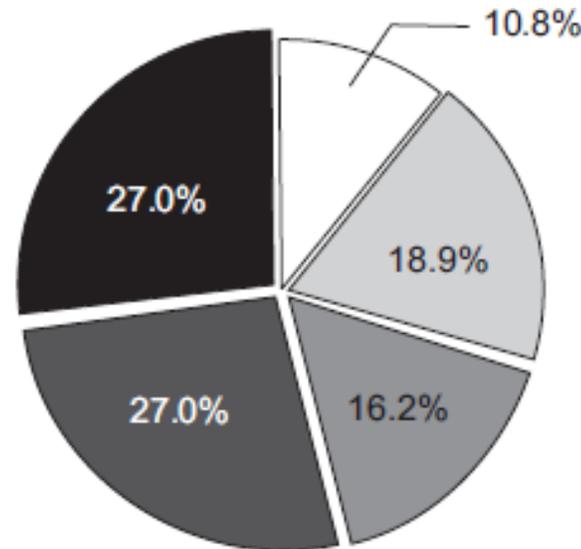
- A
- B
- C
- D
- E

'A' subscapularis tendinopathy, 'B' supraspinatus tendinopathy, 'C' infraspinatus tendinopathy, 'D' biceps long head tendinopathy, and 'E' subacromial-subdeltoid bursitis. \* $p < 0.05$  by chi-square test, as compared with non-playing arm of TT.



Draw arm of AR\*

biceps long head tendinopathy



Bow arm of AR

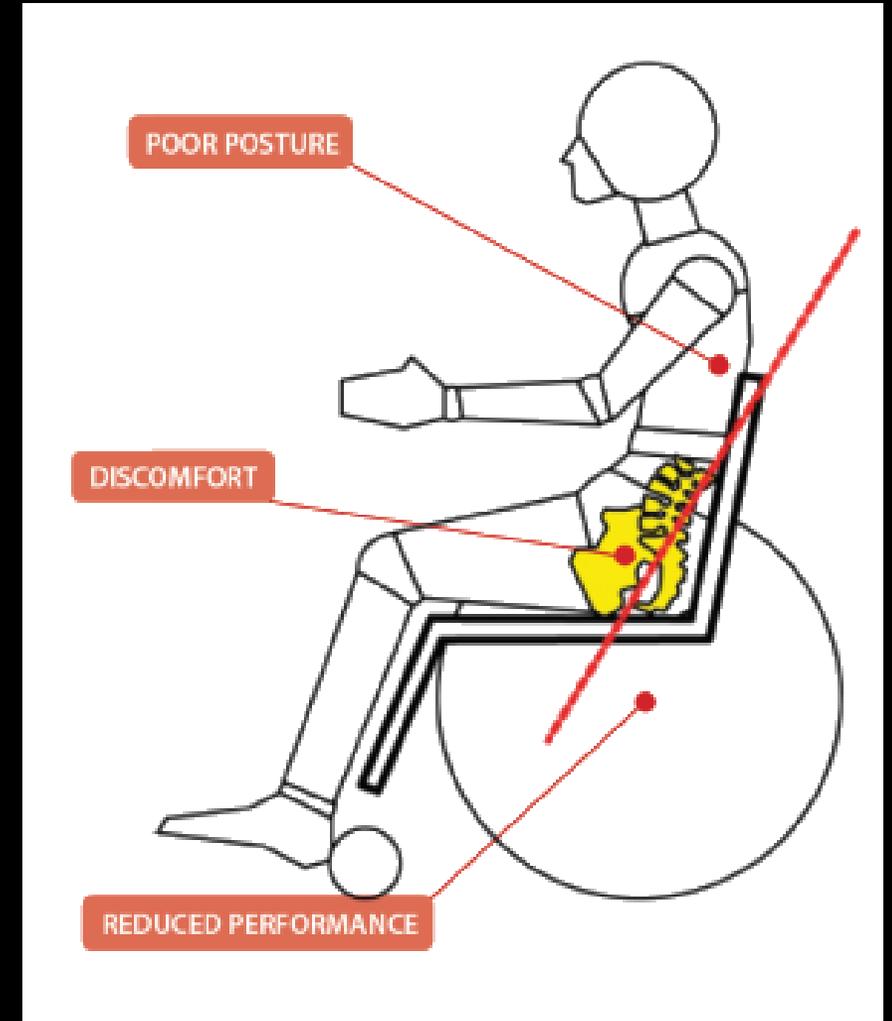
subscapularis and supraspinatus tendinopathy

## Injury Risk Factors in Para Archery

Athletes competing in wheelchair sports are especially at increased risk for overuse injuries of the shoulder complex.

A typical sitting position for these athletes involves:

- posterior pelvic tilt,
- increased thoracic kyphosis,
- and forward head position, especially for athletes with SCI.



## Injury Risk Factors in Para Archery

The high loading and repetitive nature of manual wheelchair activities of daily living and mobility have been reported to result in an increase of **scapular protraction** on the thoracic wall from the fatigue of the scapular muscles.

This altered scapular location and orientation results in an increase in scapula internal rotation and possible increase in scapula anterior tilting: leading to a decrease of the available subacromial space.



## Injury Risk Factors in Para Archery

Current research suggests that overuse shoulder injuries occur due to **a deficit in the kinetic chain**.

It is speculated that the combination of **performing the sport seated** and the **lack of power generated by the lower extremity** creates an **unstable base**, further challenging the body to produce a powerful upper extremity movement.



## Injury Risk Factors in Para Archery

Imbalance of muscle strength or muscle weakness and poor shoulder flexibility (loss of internal range of motion) are known as risk factors for chronic shoulder pain.



## Injury Risk Factors in Para Archery

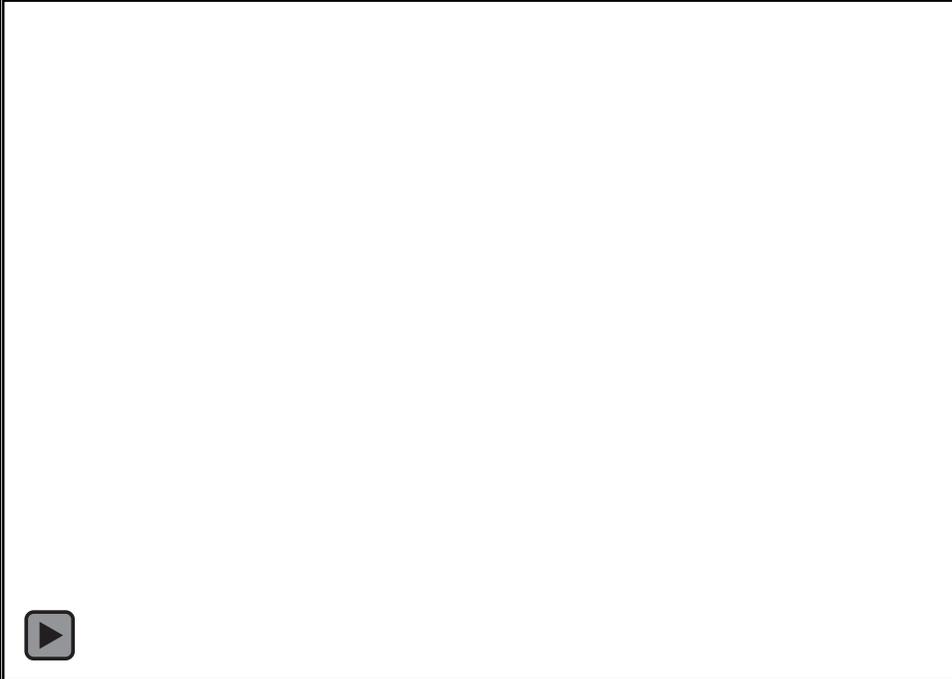
Functionally, posture and respiration are interdependent, forming one functional unit.

Accessory respiratory muscles should not be activated for regular breathing.

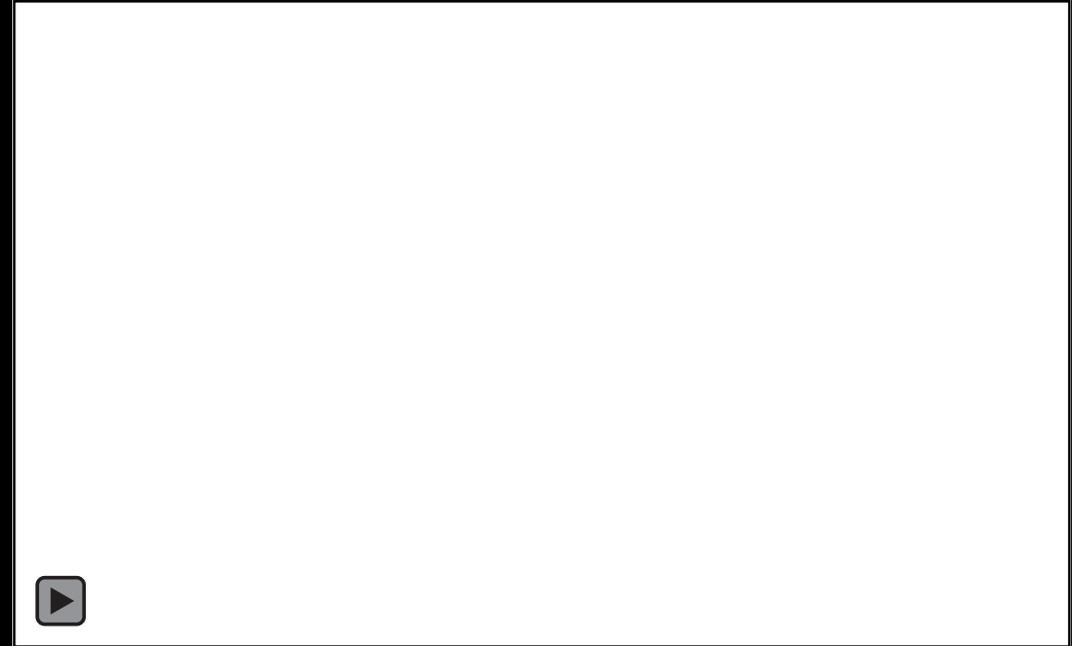


## Injury Risk Factors in Para Archery

The following findings are commonly found when **breathing dysfunction** occurs and the spine is compromised:



lifting the thorax with the accessory muscles of respiration instead of widening it in the horizontal plane is overstraining the cervical spine and musculature, contributing to recurrent cervical syndromes.



Hollowing of the abdominal wall is a sign of abnormal stereotype and paradoxical activation of the diaphragm

# Assessment and Screening

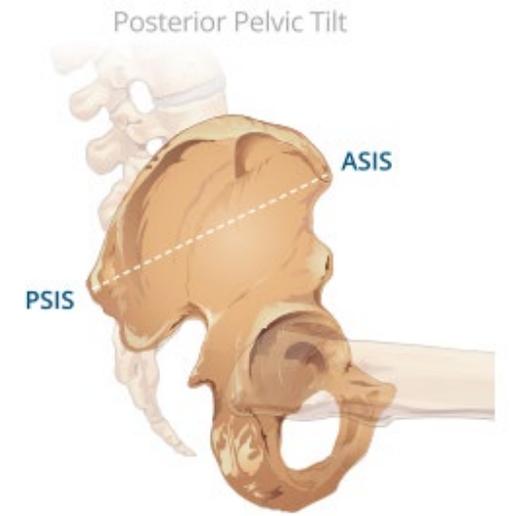
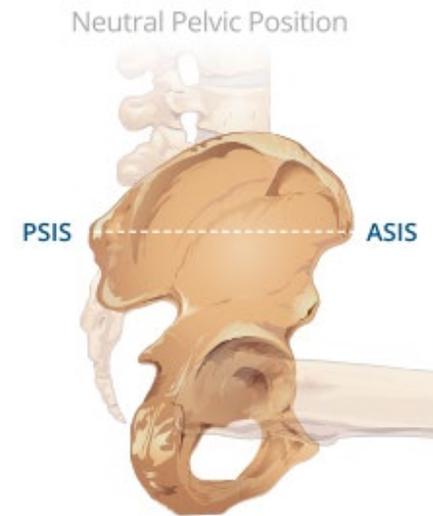
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## Assessment and Screening

- > An assessment of seated posture



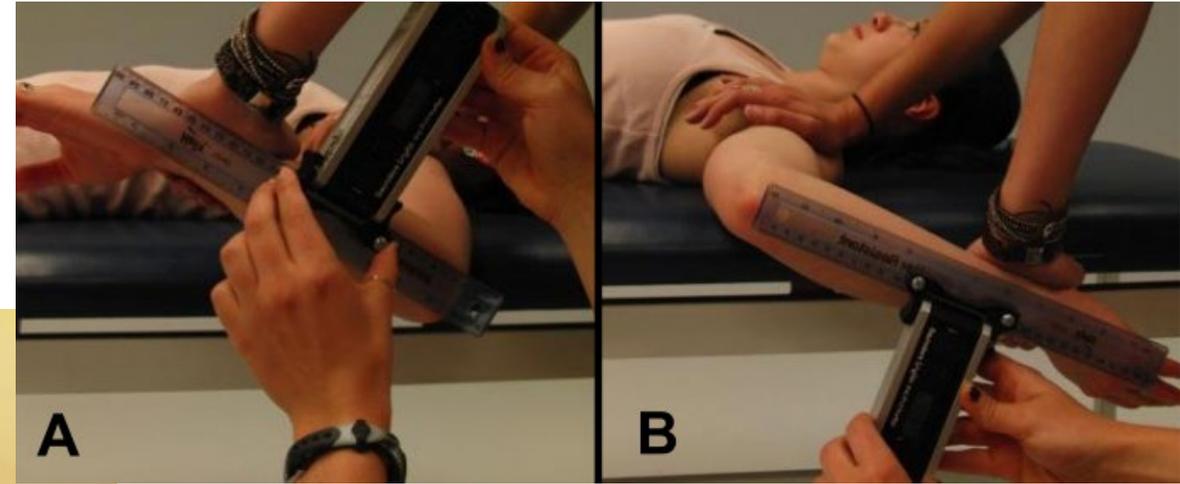
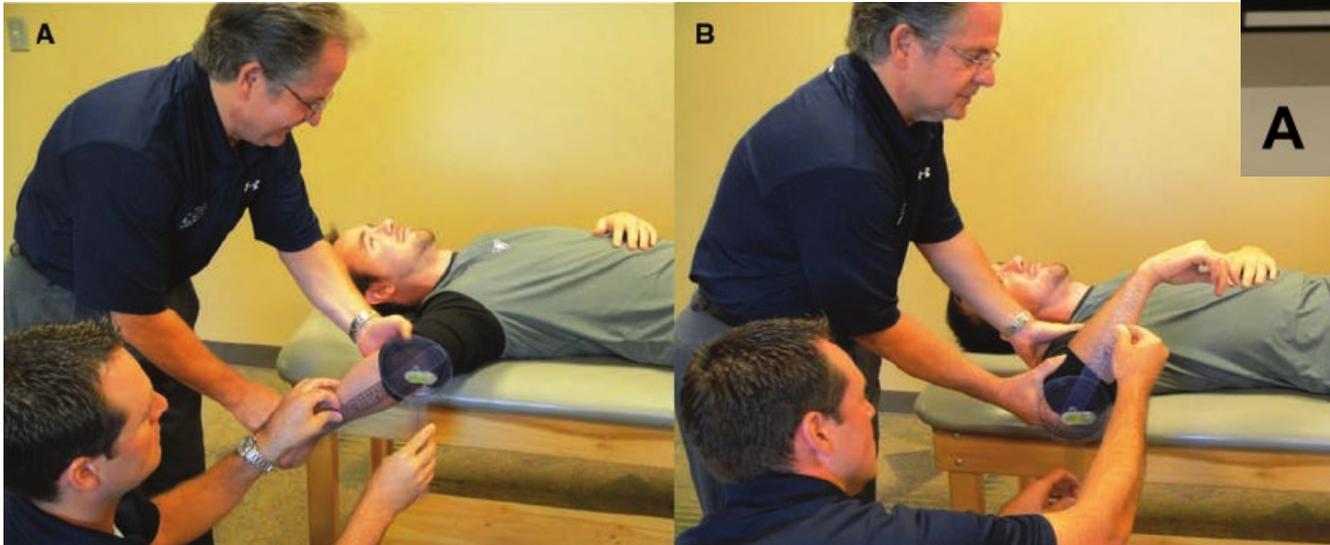
## Assessment and Screening

- > An assessment of breathing pattern



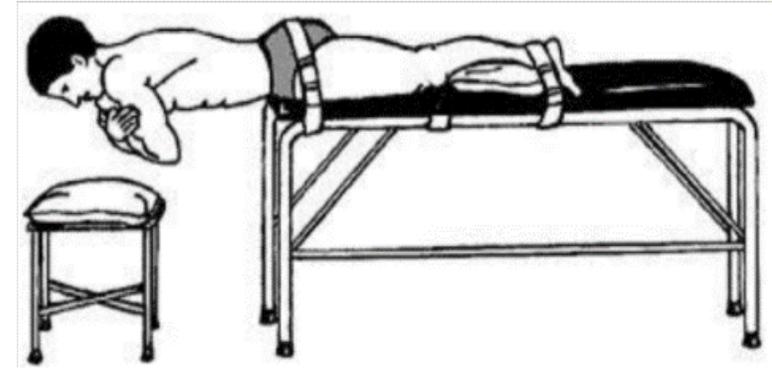
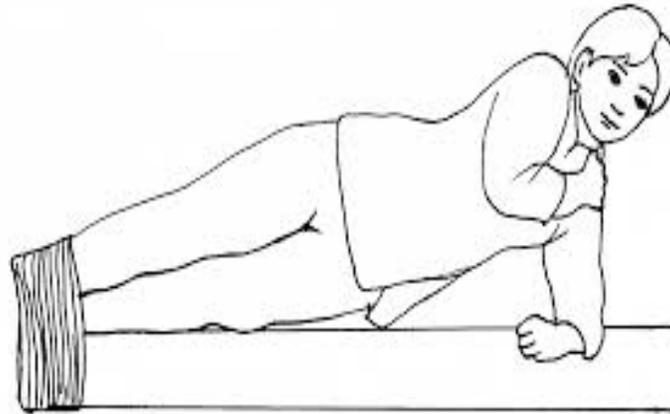
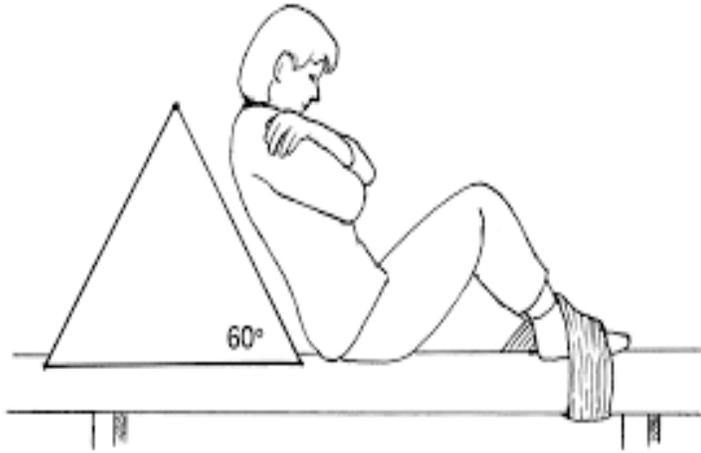
## Assessment and Screening

- > The assessment of the ROM into rotation of the shoulder



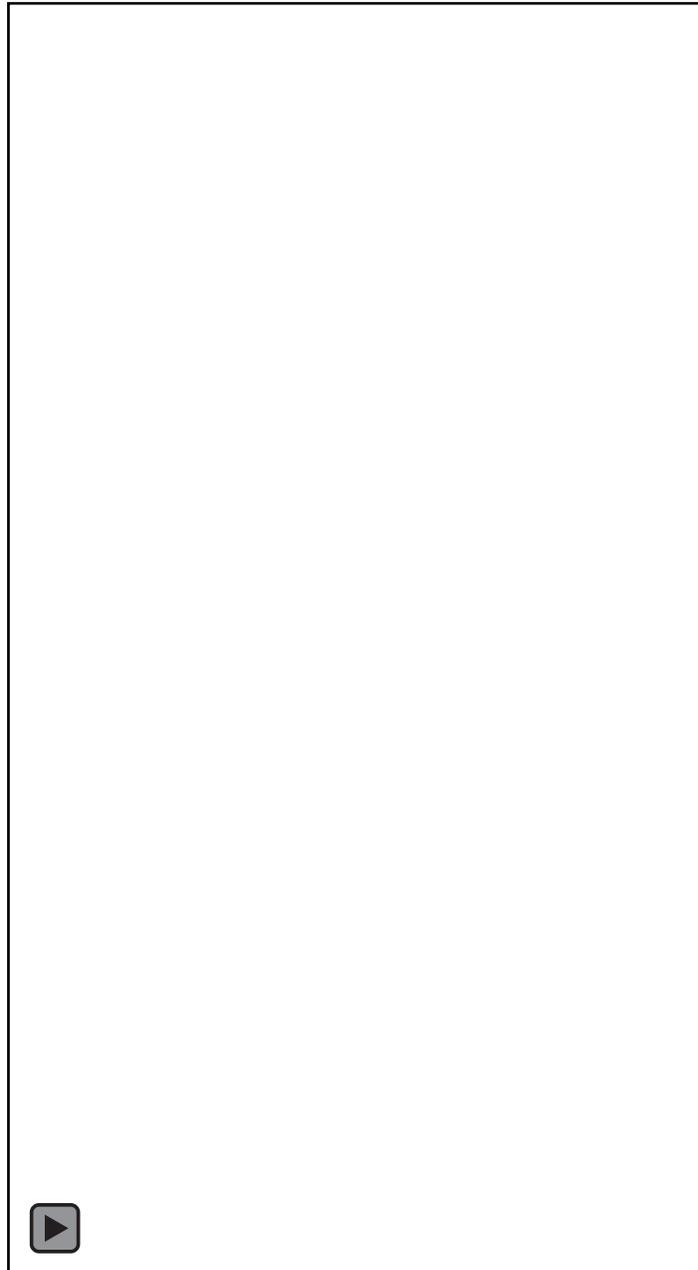
## Assessment and Screening

- > The assessment of Core Stability (trunk control)



## Assessment and Screening

- > The assessment of shoulder strength



# Prevention Strategies

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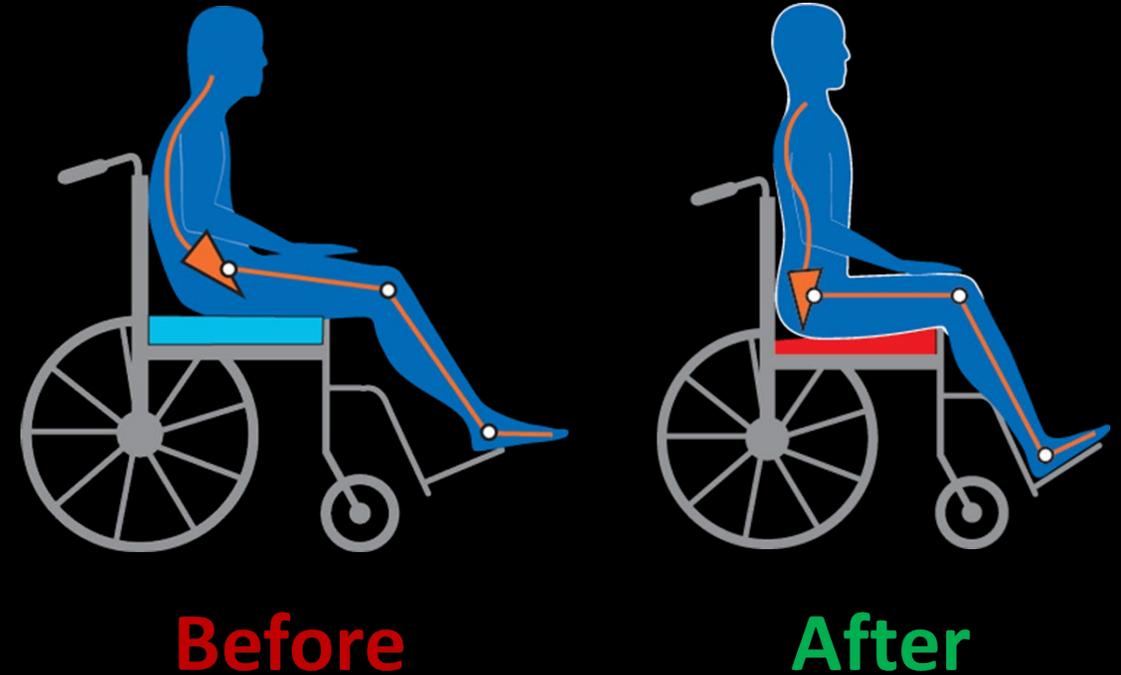
## Prevention Strategies

- > Proper warmup exercises and the use of a bow with appropriate draw weight are recommended to prevent elbow injuries
- > Enhancement of athletes' understanding of biomechanical factors that place high loads on the shoulder and are associated with typical overuse injuries



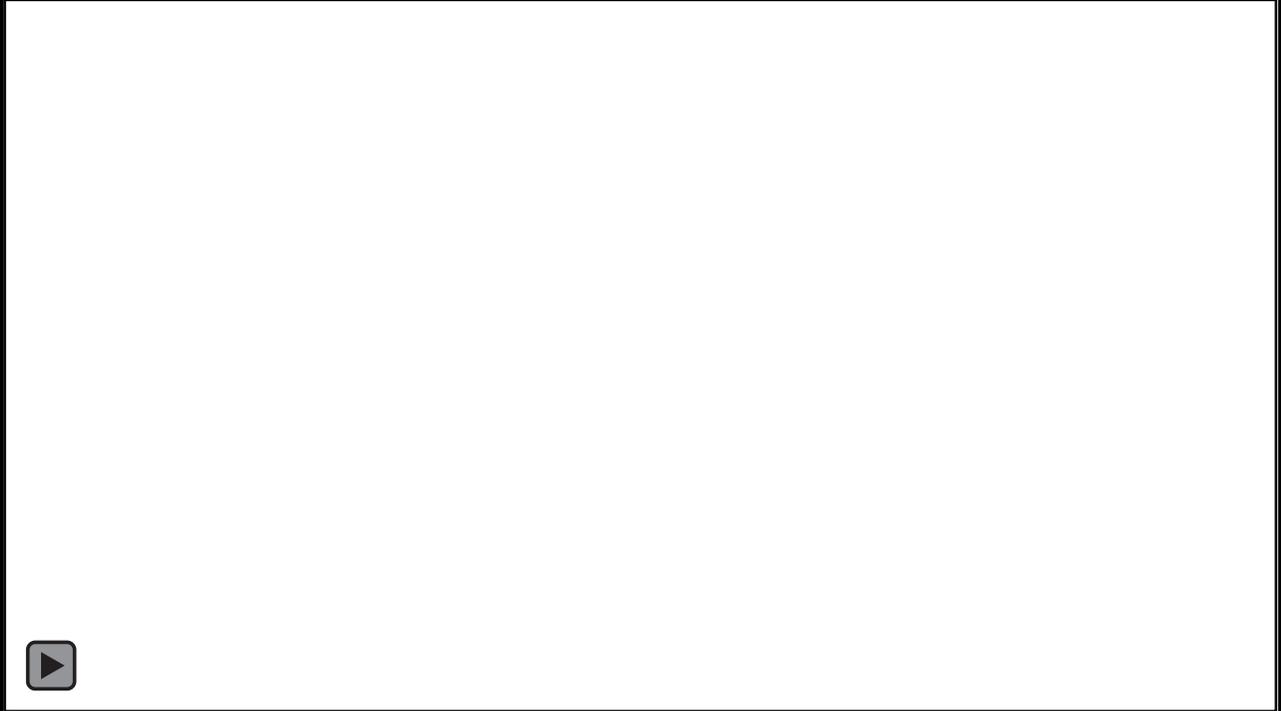
## Prevention Strategies

- > Restoration of ideal upper body posture and increase in postural awareness (Providing posterior pelvic support can reduce thoracic kyphosis and in turn improve shoulder positioning )



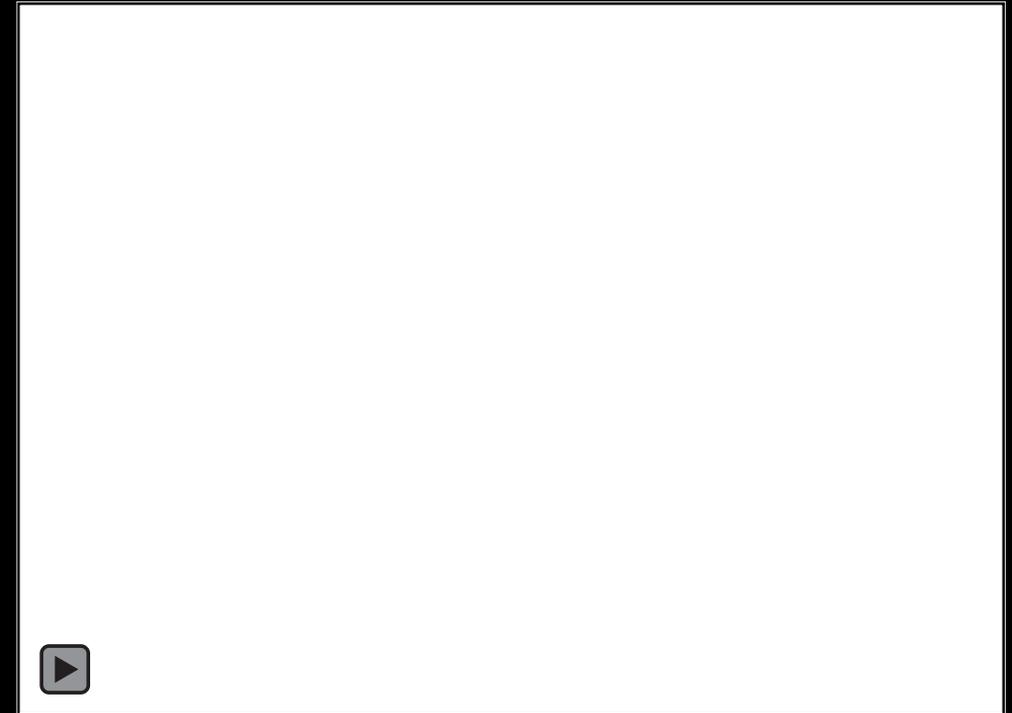
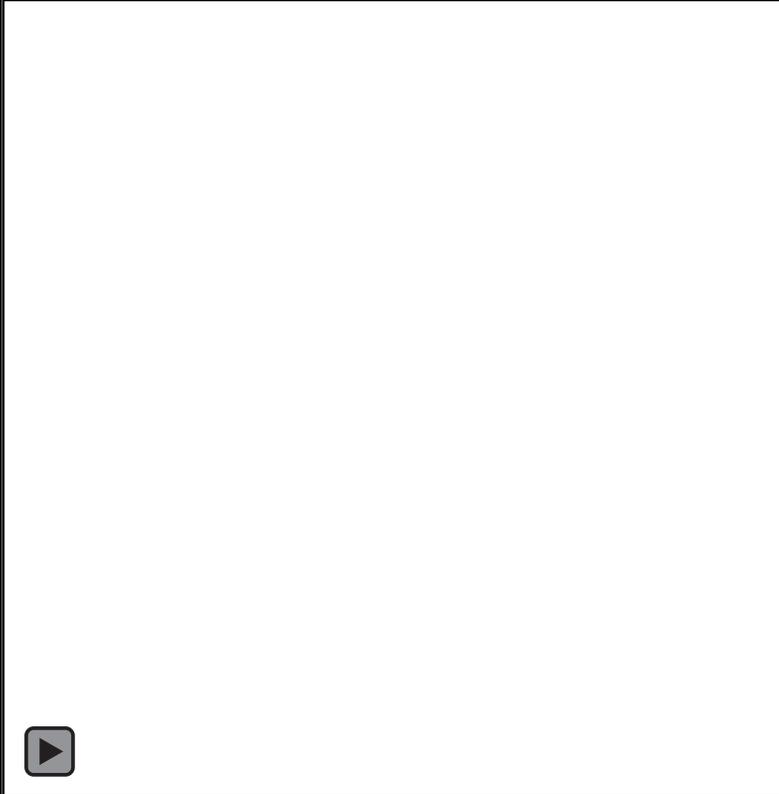
## Prevention Strategies

- > The training of ideal posture must be concurrent with training of the ideal breathing pattern.



## Prevention Strategies

- > A comprehensive core stabilization training program



## Prevention Strategies



Sleeper Stretch

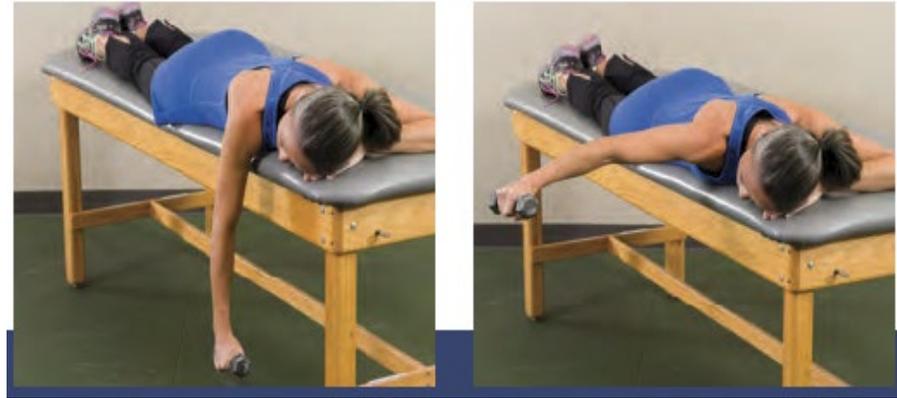
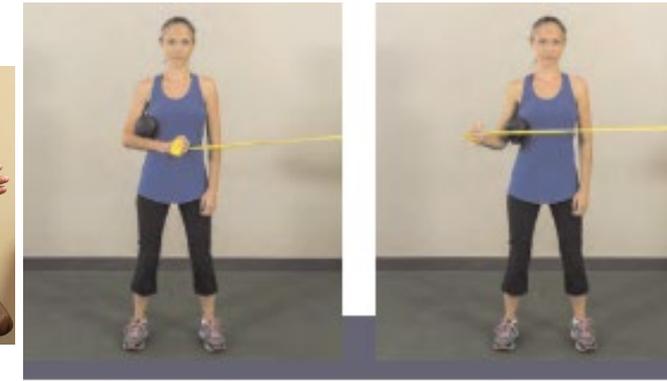


Cross arm stretch

- > Maintain Range of Motion (improvement of shoulder mobility (flexibility of the posterior glenohumeral joint capsule, pectoralis minor muscle, and upper thoracic spine)).

## Prevention Strategies

- > normalization of local muscular imbalances or weaknesses within the rotator cuff and scapular stabilizers; and bilateral symmetry
- > Maintain Strength of the Glenohumeral and Scapulothoracic Musculature



## Prevention Strategies

> Emphasize Dynamic Stabilization and Neuromuscular Control



## Prevention Strategies

- > Proper warmup exercises
- > Enhancement of athletes' understanding of biomechanical factors
- > Restoration of ideal upper body posture and increase in postural awareness
- > Training of the breathing pattern
- > Core stabilization training program
- > Improvement of shoulder mobility
- > Maintain Strength of the Glenohumeral and Scapulothoracic Musculature
- > Dynamic Stabilization and Neuromuscular Control



**Thanks for your Attention**



**Contact Information:**

 **LinkedIn: [Shadan Mohammadpour](#)**

 **Instagram: [@movement\\_health](#)**

 **E-mail: [mohamadpur@ut.ac.ir](mailto:mohamadpur@ut.ac.ir) or [Shadan.mhp@gmail.com](mailto:Shadan.mhp@gmail.com)**