

The Pull Up

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The pull up is an upper body exercise that can be used to develop the musculature in the arms and back. It is used across a variety of sports to address improvements in upper body pulling strength and muscular endurance. The aim of this article is to highlight the benefits and technical considerations of the pull up and its variations.

The importance of pulling strength

The pull up has been used in combination with bench press to assess upper body strength in many sports. Despite the importance of pulling strength in many sports, pressing tests have often assumed a predominance in the testing of many athletes across many sports. However, in sports such as judo, where pulling strength is paramount, the pulling strength of an athlete is often comparable with their pushing strength, and needs to be an important focus of testing. For example, an 80kg athlete bench pressing 120kg equates to a weighted pull up of 40kg (total load = body weight + external load, in this instance $80+40 = 120\text{kg}$). In many instances in judo, pulling strength as demonstrated in the pull up, will exceed pushing strength.

Pull up technique and variations

There are several variations in technique, involving grip orientation, thickness and modality of pulling instrument (bar, rope, judogi, rings) and hand spacing, that will provide a discrete change in exercise stimulus.

Fundamentally, the pull up comprises of 3 main actions which involve the recruitment of several muscle groups (*Table 1*).

The following description outlines the pull up as it is typically performed (*Figures 1-3*).

Pull up

The following list highlights the variations in technique from that described in *Table 2*. They are listed in order of difficulty.

1. Supine/ inverse pull up (*Figure 4a-4b*)

This exercise can be performed by individuals who can't perform a pull up. The pulling action varies to the pull up, due to the angle of the body. The angle of the pull will result in an increased activity of the shoulder protractors, particularly the rhomboids and inferior trapezius. The supine pull up can be utilised during preparation periods to accumulate training volume.

Table 1 – Movements and associated muscle groups

Movement	Movement
Elbow flexion	<ul style="list-style-type: none"> bicep brachii brachialis brachioradialis
Glenohumeral (shoulder) adduction and extension	<ul style="list-style-type: none"> latissimus dorsi teres major
Scapulothoracic motion	<ul style="list-style-type: none"> rhomboids inferior fibres of trapezius



Stuart Yule is the column editor for the 'Exercise of the Month' section.

Stuart is the current English Institute of Sport Strength and Conditioning coach for Judo. He is responsible for delivering National S&C services to world class funded players across the UK. Stuart previously worked for the Scottish Institute of Sport, where he had the role of leading the S&C service to athletes in the West of Scotland as well as leading and coordinating S&C nationally for the Judo and Badminton programmes. Stuart is a physiotherapy graduate and his sporting background lies in Olympic Weightlifting, where he represented Scotland at two Commonwealth Games.



Figure 1.

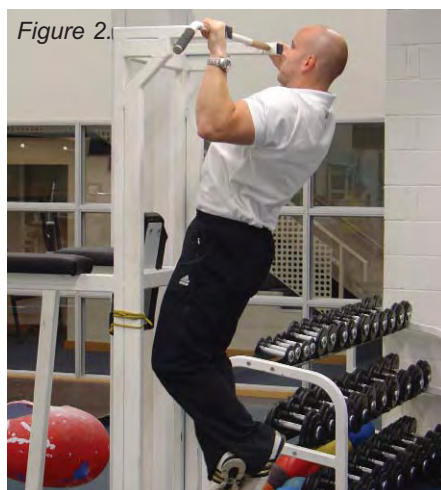


Figure 2.

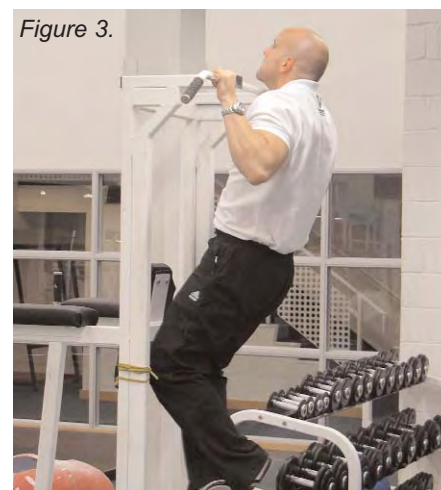


Figure 3.



Figure 4a.



Figure 4b.

2. Band assisted pull ups / chin ups (Figure 5)

As with the supine pull-ups, the band pull can be used by individuals who can't perform a body weight pull up. The band acts like a 'spotter' and assists the individual to complete the concentric portion of the exercise.

3. Chin up (Figure 6)

This technique involves a supinated grip, which will increase the recruitment of the bicep brachii and brachialis.

4. Towel / judogi pull ups (Figure 7)

The pull up can be performed by draping a strong towel or judogi over a bar. This will increase the difficulty of the exercise due to the increased grip involvement. Also, due to the neutral pronation of the hands and the increased demand on the grip there will be increased recruitment of the brachioradialis and an increased stimulus of the forearm and hand musculature.

5. Weighted pull ups + variations (Figure 8)

Weights can be attached for increasing the load of the exercise and will be crucial for athletes aiming for maximal strength development.

Table 2. Pull up technique from which variations can be applied.

Action	Coaching cue	Purpose of coaching cue
Grip bar with an overhand (pronated) grip shoulder width apart.	<ol style="list-style-type: none"> 1. Squeeze bar. 2. Pull shoulder blades down and back. 	<p>Ensures all forces produced are transferred effectively to ensure a strong and powerful motion.</p> <p>Maintaining a correct shoulder girdle alignment will ensure optimal stress is applied through the desired joints musculature.</p>
Hang from bar with arms fully extended.		
Keep neutral head alignment.		
Flex through elbows and pull body up to bar.	<ol style="list-style-type: none"> 1. Keep head up. 2. Keep chest high and pull strongly through hands. 	<p>Maintaining head and chest alignment enables optimal thoracic spine alignment, together with optimal scapula, thoracic and shoulder girdle movement, and subsequently will ensure optimal stimuli of the desired musculature.</p>
Continue to flex at elbow and shoulder until the chin is above the bar.	<ol style="list-style-type: none"> 1. For a beginning athlete – pull, pull, pull!!! 2. For an advanced athlete – rip the bar from the rack. 	<p>Maximal intent must be applied. The end of the movement depending on ability will become increasingly hard and it is imperative the athlete does not relax until the movement is complete.</p>
Start to exhale.		
Extend arms and extend at shoulder until fully extended.	<ol style="list-style-type: none"> 1. Keep control. 2. Maintain head alignment and keep chest high. 	<p>It is important that the athlete controls the eccentric part of this movement firstly to avoid unnecessary stress through glenohumeral structures and the end of range and secondly to avoid a swinging action. Swinging will be discussed later.</p>

Practical application

The successful implementation of any exercise is dependant on many variables other than its mere inclusion in the strength training programme. The application and manipulation of training principles, such as training volumes and intensities, is vital to ensure the athlete training is productive and aids them in achieving their strength and performance goals. In addition, training intent, demonstrated through a sound mastery of the appropriate technique, is fundamental to increasing the strength potential of the athlete.

The utilisation of the pull up and / or any of its variation can be an effective strength training exercise for athletes in many sports. The physical and technical demands of judo, wrestling and rugby are such that a high level of pulling and grip strength is required. The strength requirements indicate that the effective implementation and manipulation of the pull up exercise and its variation will have a positive impact on increasing the strength potential for this group of athletes.

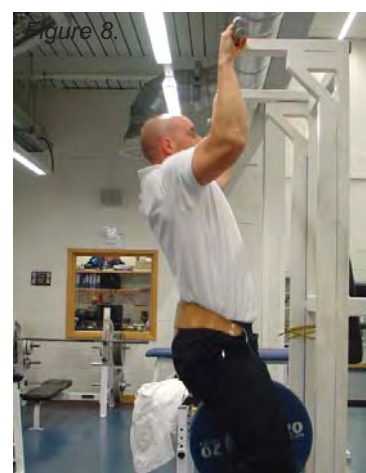
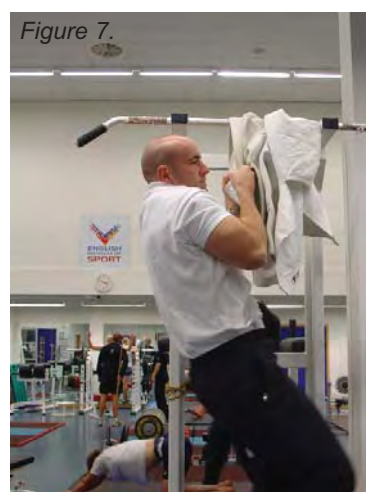
The exercise selection and loading will be dependant on the ability of the athlete. The primary competence is the athlete's ability to perform a pull up and the number of repetitions they can perform with body weight. The following examples illustrate a pull up progression for 2 different populations. Example 1 is for a novice athlete who can complete a pull up well, but is only able to achieve a maximum of 6 repetitions. The 2nd example is for a well trained strength/power athlete, who requires an increase in maximal pulling and grip strength. It should be noted that the tables below should be integrated in a periodized manner with other exercises to address the overall physical needs of the athlete.

Progression for novice athlete

	Phase 1	Phase 2	Phase 3
<i>Phase</i>	Physical preparation 1	Physical preparation 2	Physical preparation 3
<i>Pull up stimuli 1</i>	Supine chins 3-5 x 10-12	Body weight pull ups 3-5 x 4-6	Weighted pull ups 3-5 x 4-5
<i>Pull up stimuli 2</i>	Band pull ups 3-5 x 10-12	Body weight chin ups 3-5 x 5-8	Weighted chin ups 3x-5 x 4-6
<i>Pull up stimuli 3</i>	Body weight pull ups 3-5 x 4	Supine chins 3-5 x 12-15	Weighted supine pull ups 3-5 x 10

Progression for advanced athlete

	Phase 1	Phase 2	Phase 3
<i>Phase</i>	Physical preparation 1	Physical preparation 2	Physical preparation 3
<i>Pull up stimuli 1</i>	Body weight pull ups 5x10 – 60s recovery	Weighted pull ups 3-5 x 10 2-3 minutes recovery	Weighted chins/ pull ups 3-5 x 3- 5
<i>Pull up stimuli 2</i>	Body weight judogi chins 3 x 10	Body weight judogi pull ups 3-5 x 10	Weighted judogi pull up 3-5 x 5
<i>Pull up stimuli 3</i>	Supine chins 3x12-15 – 60s recovery		



The desired adaptations from the successful implementation of the pull up are improvements in hand, arm and back strength. Due to the muscle actions, one of the desired adaptations is an increase in latissimus dorsi strength. The latissimus dorsi's proximal attachments are the spinous processes of the lower six thoracic vertebrae and from the posterior layer of the thoracolumbar fascia. Due to these origin attachments, the latissimus dorsi is involved in lumbar extension movement generation and therefore may contribute to stiffening and stabilizing forces in the lumbar spine.² To ensure there is a positive strength training effect of the latissimus dorsi and the potential reduction of injury potential is realised, the specificity of movement and the functional movement patterns of the sport must be considered. The pull up may be the exercise of choice to fully develop the shoulder and back musculature, however considering the specific force and movement characteristics of a sport will guide and direct the appropriate pull up exercise selection. An example of how changes in technique alters the recruitment of the musculature and subsequently affects any desired training effects, is illustrated in research exploring the pull down exercise. The pull down and pull up have very similar movement patterns in the upper body. Electromyography investigations highlighted that a wide grip hand position with the bar pulled anteriorly to the chest increased recruitment of latissimus dorsi. Meanwhile, a close grip hand position elicited more activity from the

pectoralis major (Signorile et al, 2002). This research highlights the importance of specific force and movement analysis, to ensure the appropriate pull up exercise and loadings are prescribed.

In conclusion, the pull up is a versatile exercise that can be used in a variety of ways to achieve a desired upper body training effect. A range of loads and technical variations can be utilised depending on the ability, training age and sporting demands of the athlete. When implementing the pull up into a strength and conditioning programme, the consideration of training principles such as specificity, overload and variation is paramount. This will ensure the athlete fully realises their strength training goals and there is a positive transfer of training effect.

References

1. Delavier, F. (2001) Strength Training Anatomy, Champaign Ill, Human Kinetics.
2. McGill, S. Low Back Disorders, (2002) Evidence – Based Prevention and Rehabilitation, Champaign Ill, Human Kinetics.
3. Moore, K.L., and Agur, A.M. (1995) Essential Clinical Anatomy, Williams & Williams.
4. Signorile, J.F., Attila, Z.J. and Szwed, S.P. (2002) A Comparative Electromyographical Investigation of Muscle Utilization Patterns Using Various Hand Positions During the Lat Pull – down. Journal of Strength and Conditioning Research; 16(4), 539-546.

2009 UKSCA Diary of Events

The 2009 schedule for workshops and assessment days has now been finalised and the first 6 months is shown below. The full programme containing details of our workshops and booking forms are available on our website – www.ukzca.org.uk.

Assessment days

10 January – Lee Valley Athletic Stadium
17 January – University of Ulster
31 January – SportCity, Manchester
8 March – St Mary's University College, London
4 April – UWIC, Cardiff
25 April – University of Ulster
2 May – University of Birmingham
6 June – University of Stirling

WL Training Days

1 February – SportCity, Manchester
5 April – UWIC, Cardiff
3 May – University of Birmingham
7 June – University of Stirling

WL Workshops

17/18 January – University of Stirling
7/8 Feb – Lee Valley Athletic Stadium
14/15 March – Velodrome, Manchester
25/26 April – St Mary's University College, London
9/10 May – WIS, Cardiff
13/14 June – University of Birmingham

PAS workshops

25/26 April – Lee Valley Athletic Stadium
23/24 May – SportCity, Manchester
27/28 June – St Mary's University College, London

Taster Sessions

24 Jan – WIS, Cardiff
25 April – St Mary's University College, London

Level 1

3-4 January – University of Ulster
21/22 February – Lee Valley
13/14 June – University of Stirling



The UK Strength & Conditioning Association