Weighted pull-ups

Introduction

I believe that the pull-up or chin-up is one of the great strength training exercises. My belief is that if you possess great pull-up, bench press, full squat and Romanian deadlift strength, then you are more than halfway to achieving your sports strength/power requirements.

Why? Because these four exercises allow for the development of maximal strength in the four fundamental body movements (ie. upper body pulling, upper body pushing, lower body pushing, lower body pulling). Once you developed adequate maximal strength in these movements, then all you have to do is transfer it into more sport-specific exercises (ie. Rotational exercises, split leg position exercises, alternating arm or leg exercises) or into power. Typically this is easier than developing maximal strength in the first instance.

Figure 1. How about 7-reps with 30 kg?

Figure 2. Or 9-reps with 30 kg?

Bodyweight versus added resistance

For any real athlete, bodyweight is typically to light to develop maximal strength (1 to 5 or 6 reps). So while bodyweight pull-ups can be done for muscle

building and strength-endurance, you need to add extra weight to fully develop maximal strength.

Determining maximal strength levels in the pull-up

To determine pull-up maximal strength, simply add the extra resistance to the athletes' bodyweight. For example, if the athlete can do 3-reps with 20 kg attached to their waist and they weigh 90 kg, then their 3-rep max pull-up strength is 110 kg (20 kg + 90 kg = 120 kg). You can do a full 1RM test, working up in weight till a 1RM is achieved, same as you would for bench press or squat or you can do a "reps to fatigue" (RTF) test to derive an extrapolated 1RM. For the RTF test, the athletes perform as many reps as possible with a pre-determined resistance such as 20 or 30 kg. The extra resistance is added to each athletes bodyweight, which becomes the total pull-up mass. This total pull-up mass is multiplied by the appropriate correction factor that corresponds to the amount of repetitions they performed and an extrapolated 1RM is determined. Examples of this are provided in Table 1. For example, the first athlete tested weighed 109 kg and performed 3 reps with 30 kg attached to their waist. Therefore the total pull-up mass is 139 kg (109 + 30 kg) and the correction factor for extrapolating a 1 RM from a 3 RM is 1.08. Therefore, 139 kg x 1.08 = 150 kg.

Figure 3. Is 10-reps with 30 kg OK?

Figure 4. What about 10-reps with 30 kg when you already weigh 107 kg?

Table 1. An example of large group testing of extrapolated 1RM pull-up strength. A "reps to fatigue" (RTF) test is performed with a set resistance that should allow for less then 10-reps. The correction factor applicable to how many reps were performed is then multiplied by the total pull-up mass (bodyweight + added weight).* The correction factors are from the #2 reference below and are freely available at www.danbakerstrength.com

Added weight	Bodyweight	Total pull-up mass	# of reps	Correction factor*	Pull-up 1RM
30 kg	109	139	3	1.08	150
30 kg	121	151	4	1.12	169
30 kg	97	127	5	1.16	147.5
30 kg	92	122	6	1.2	146.5
30 kg	93	123	7	1.23	151.5
40 kg	81	121	8	1.26	152.5
40 kg	84	124	6	1.2	149
20 kg	102	122	2	1.05	128
20 kg	103	123	3	1.08	133

Testing of large groups of athletes

I have tested the pull-up 1RM in the past, but have found that a RTF test is extremely reliable and accurate in extrapolating the 1RM and far quicker (see the referenced papers at the end of the article). So what I do now is use certain added resistances when performing a RTF to extrapolate pull-up 1RM. For professional rugby league players I mainly use 30 kg ~ this is a resistance that allows most of them to perform 2-7 reps, which is the range where RTF tests are most valid. For the extremely strong, I use 40 kg as with 30 kg, they perform more than 10 reps, making the test less accurate as a test of maximal strength. For younger rugby league athletes (eg. NYC Under 20 yrs players), typically I use 20 kg. Obviously for the less strong, bodyweight or bodyweight plus 10 kg might suffice.

For the procedure, the athletes typically perform this test after their 1RM bench press. They are fairly warmed up after a 1RM bench press, but still perform 3-reps with bodyweight for a pull-up specific warm-up and then 1-rep with 20 kg for NRL or 10 kg for NYC. After a rest, the testing weight is attached to them and they

are assisted to the point of chin above the bar. From here they commence to perform pull-ups till fatigue, typically after 3-5 reps. We have plenty of pull-up bars at the Broncos, so the whole testing procedure only takes about 10 minutes for 9-12 athletes.

Figure 5. PJ Marsh, the current Broncos pull-up King ~ 11 reps with 30 kg, 6 with 40 kg.

What should an athletes' pull-up 1RM be? Is there a ratio to bench press strength?

This depends upon the sport. Swimmers and kayakers are going to possess much higher relative pull-up scores than many other athletes because they are dominant upper body pulling athletes. The best pull-up strength that I have tested was former Bronco Ben Ikin, who did a full 1 rep max with 80 kg attached to his waist at a bodyweight of 97 kg (1RM= 177 kg). He would do sets of 5-6 reps with 40 kg and 3 reps with 50+ kg.

The average figures for NRL and State league athletes are contained in the references below. **NRL players are stronger than State league players in 1RM pull-ups** and 1RM bench press, but everyone focuses on the bench press result! My important recommendation is that **an athletes weighted pull-up be equal to their bench press** (either as a 1RM or for the equivalent amount of reps), which was a key finding regarding NRL players in the first reference below. State league and younger

rugby league players actually have higher 1RM pull-ups compared to their 1RM bench press (by about 5%), but this is due to their 1RM bench press not being high enough. The bench press will improve after the pull-up strength has been developed!

The Queensland Academy of Sport strength and conditioning coaches are of a like mind to myself regarding weighted pull-ups. They have 13 pull-up bar stations (we only have 11 at the Broncos) and for most of the elite female swimmers, the goal is to be able to perform at least 3 reps with an extra 20 kg. The top female swimmers at the QAS can perform 3 reps with 30 kg. The best that a Bronco rugby league player (PJ Marsh) can perform is 11 reps with 30 kg.

Which grip or type of for pull-ups is best?

All grips work great and are just variations. I test using the supinated grip (palms facing you), but we train the following varieties of pull-ups: supinated, pronated (palms facing away), neutral (palms facing each other), off-set grip, commando grip, Hanging Gym Handle versions (like gymnastic rings), rope climbing (just another pull-up version really) and so on. They are all good and there are photos of them in the free "Chin-ups v lat pulldowns" article on the website www.danbakerstrength.com

What is the best way to add weight?

The older method was to tie extra weights to a rope (as seen in the photos in this article) or hold a dumbbell between the legs. Now there are specialized pull-up belts that fit around the waist and allow weight to be attached via chain.

Figure 6. Special belts allow for extra weight to be added during the pull-ups.

These belts are much more effective as they keep the extra resistance under the centre of gravity and limit body swaying during the movement.

Pull-ups for upper back muscular development.

The photos in this article illustrate rugby league players performing weighted pull-ups. Note the incredible upper back musculature of these athletes. These are not bodybuilders or powerlifters, but rugby league players. The key to effective upper body development is the upper back.

Every strength coach gets asked by the young males they coach "how can I improve my bench press/get a bigger chest". My typical answer is "get better at pull-ups and build your upper back because they are your foundation and then the bench press/chest will follow". All the athletes in the photos are 140 kg bench pressers and all can do 7 or more reps with 30 kg attached to their waist during pull-up testing. But they possessed the pull-up strength first and gradually their bench press strength increased to equal their pull-up strength. Moral of the story ~ get good at pull-ups, it is your upper body foundation.

A super effective pull-up set for muscle building

Not only are pull-ups effective for maximal strength development but also for muscular development. The most difficult pull-up set we do at the Broncos for muscle building is called the "Satan set". It is called this because it consists of 6-6-6 reps and feels like you are in hell. How it is performed is:

a) the athletes performs 6 weighted pull-ups, then holds themselves above the bar while the pull-up weights belt is slipped off their waist by their training partner,

b) then 6 bodyweight pull-ups are performed and

c) then a #2 band that has already been attached to the bar is placed under their knees to provide some assistance during the last 6 reps (see the "Chin v Lat pulldown" article to see a photo of this.

So basically it consists of a drop-set of 6 resisted reps, 6 bodyweight reps and 6 assisted reps (hence 6-6-6, the devils number). Typically fatigue is reached 3 times within the 18-rep set, making it very strenuous. Accordingly this set is only done once or twice! A typical prescription may be 2 sets of 6 reps of weighted pull-ups and the third set being the Satan set.

Are some athletes are too heavy for pull-ups?

Some athletes are too heavy (or too weak) to perform multiple sets of high rep pull-ups, so I will substitute pull-downs for pull-ups for these athletes. Typically this would be the rugby league/union forwards who are over 100 kg (which is all of them). So for sets of 8 or more reps, it is pull-downs (for muscle size training), but for 6 reps and below, it is pull-ups (for maximal strength training). The obvious exception being the Satan set which is both strength and size building and is obviously an advanced option. I also make use of the band-assisted pull-up or jumping pull-up where applicable for weaker athletes. A #2 band suits most athletes, male or female.

Also after shoulder surgery, you may have to work back into pull-ups, via rows, pull-downs etc across 14-20+ weeks before you can safely pull-up again. Furthermore when you do get back into pull-ups, stay with close grip varieties for a long time (perhaps permanently) if you have had shoulder surgery or major shoulder problems.

Conclusion

Weighted pull-ups can be used to develop maximal strength or muscle size, all that changes is the number of reps, rest period and so on. Every strong athlete that I have trained was very good at weighted pull-ups. They are a compulsory strength testing exercise at the Broncos. If you are not performing them, and you are capable of doing them, then you should include them in your training.

References

1. Baker, D. & Newton, R. U. "An analysis of the ratio and relationship between upper body pressing and pulling strength." **J. Strength Cond. Res**., 18(3):594-598. 2004.

2. Baker, D. "Predicting 1RM or sub-maximal strength levels from simple "reps to fatigue" (RTF) tests." **Strength and Conditioning Coach**, 12(4):19-24. 2004

3. Baker, D. "Lat pull-down and chin-up - Which is better? – Ask Dr. Dan." **Strength and Conditioning Coach.** 15(2):30-32. 2007.