

How best to use Torque to load the core

Originally published 19 May 2020 · fatchfitness.com



Like any other muscle group, when training your core, you should try to increase the load as you get stronger (rather than just increasing the repetitions) and there are a couple of ways you can go about increasing muscle tension:

1. You can increase the resistance by adding a weight or other external resistance to the exercise.



2. You can use the biomechanic principles of Torque to increase the external resistance.

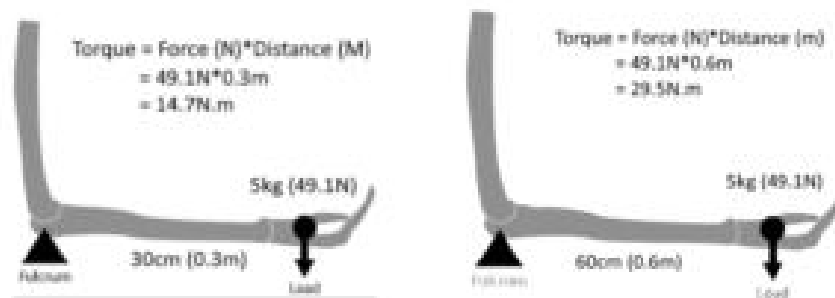
When trying to address point 1. adding weight is often problematic, unless you are using a situp machine. It can be quite dangerous to add additional resistance to your core exercises. This is where the concept of torque can be quite useful in designing effective exercises in the gym that will provide the additional load through your core without having to swing or carry large loads!!

TORQUE

Torque is a term that most people will have all heard of before, likely in the context of a car engine (output) or a tool used in working on cars (eg torque wrench). Torque is the **rotational force around an axis** and is determined by the following equation:

Torque = distance (from axis of rotation) x Force (perpendicular distance from the force to the axis).

$$T = F(N) * D(m)$$



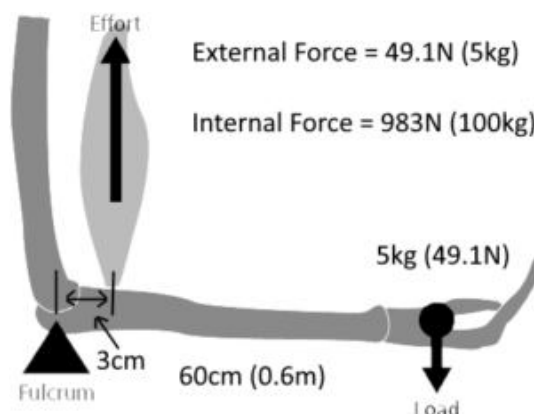
The above diagrams indicate that torque is the combination of the total load (in this case 5kg – converted to 49.1Newtons) multiplied by the distance from the point of rotation (in this case the length of the forearm/hand = 30cm or 0.3m). As you can see from the above two examples, there is a direct relationship to the total amount of torque generated and the distance the force (weight lifted) is away from the fulcrum (point of rotation).

Effect of Torque on Muscle load.

To offset this “external Torque” we have to generate an “internal torque” – this is the amount of force your muscle (in this case your bicep) needs to generate to resist the external load. If we modify the above Torque equation we can find out what amount of force is required by the muscle (internal torque) to offset the external torque.

$$T = F * D : F = T / D$$

In example 1 – if we accept that the bicep muscle is attached 3cm from the fulcrum,



then the force required is: $F(m) = 14.7 / 0.03 = 490N$ (50kg) **In example 2** – the force required is: $Fm = 29.5 / 0.03 = 983N$ (100kg) So just by increasing the distance from the point of rotation by 30cm we have doubled the amount of force required by the muscle to resist the **same external load**. This is the power of understanding torque in relation to muscle loading. If we focus on the core, the exercise goal should be to try to move the external load as far from the point of rotation as possible whilst maintaining correct pelvic positioning (see previous article). .

Exercise Examples:



Pallof Press

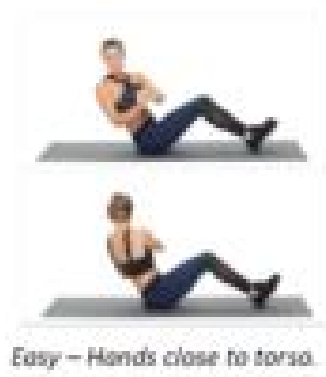
A great example of an exercise using the above principle is the Pallof press: The resistance stays the same but the torque created is increased as the distance b/w the point of rotation (the torso) and the resistance (contact with the



band) is increased. . **Standing Core rotations**

A variation

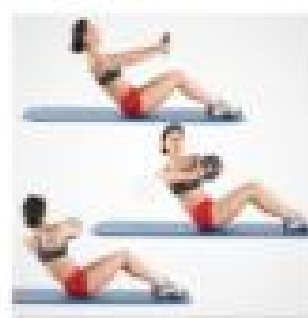
of the Pallof Press – again the level of resistance on the core is related to how far out you hold your arms – start close to your body as a beginner and increase the distance away from your body as you improve. . . . **Russian Twists** Whilst this is an advanced exercise, you can easily apply the above principle to start with an easier version prior to really loading up the torque applied to the torso.



Easy – Hands close to torso.



Medium – arms out straight



Hard – Add weight + distance.



. Supine Leg Rotations

This is another great exercise that by simply increasing the distance (straightening your legs), the torque/load on your core increases dramatically. As an additional note, if you are thinking of performing this exercise, ensure that your upper body/shoulders both stay firmly on the ground at all times. Also you should be able to stop the legs at any angle and hold firm without your upper body lifting or giving way. .

.SUMMARY:

1. Torque is the rotational stress placed around a joint.
2. You can increase torque on a joint/muscle group by either increasing the force/weight or the distance this force is from the point of rotation.
3. It is generally safer and easier to increase the distance component of torque than the weight when looking to increase the load on your core.