

Brush up on pushups

Different variations of classic move offer their own challenges and benefits

by: Jill Barker

Exercises fall in and out of fashion, just like skirt lengths and hairstyles. But one exercise has managed to weather the fickleness of popularity and secure a spot in almost every list of 10 top exercises.

Versatile and effective, the pushup is an upper-body exercise targeting the chest, shoulders and triceps. That said, anyone who has struggled through multiple reps knows they're one of those exercises that everyone loves to hate. Yet whether you're attempting a Rocky Balboa set of one-armed pushups or a more basic variation from the knees, there's no arguing that they build upper body strength and endurance.

Unlike exercises that use barbells or dumbbells, pushups use body weight to build strength and endurance. Yet, often exercisers have no idea how much of that weight they're lifting and lowering during a pushup and how much the load varies when the exercise is modified. This lack of information can create a challenge when it comes to determining what type of pushup will best fulfil individual training goals.

Even in studies designed to evaluate intensity, there's no standardized technique to determine how much load is being applied to the arms. Some studies measure body weight with the arms extended (during the "up" position of the exercise) and some while the elbows are bent (during the "down" phase of the exercise). Also important to note is that load is usually expressed by percentage of body weight and can change depending on how the exercise is being supported (or not) on the ground.

Given all those caveats, several studies suggest that 60 to 70 per cent of body weight is supported by the arms during the down position of a traditional pushup performed from the feet. With the arms extended, ground forces measure eight to 21 per cent lighter. And for all those who think the load is divided evenly between both arms, more weight is actually supported by the dominant arm (the arm you write or throw with) versus the non-dominant arm.

Comparatively, pushups from the knees support 55 to 62 per cent of body weight when the arms are bent - the lowest measure of peak force as compared with all other types of pushups.

Faster pushups increased peak force of the exercise by a factor of 1:2. However, when the exercise is slowed down, there is greater activation of the muscles of the chest and upper arm. It's also worth noting that slowing the exercise resulted in less stress on the elbow joint, which makes it more desirable from an injury prevention point of view.

When it comes to determining the speed of a pushup, there seems to be no standard as to how fast is fast. One study attempted to classify tempo, suggesting that seven pushups in 10 seconds is fast, five pushups in 10 seconds is normal speed and four pushups in 10 seconds is slow.

Moving the hands closer together or further apart can affect the amount of force applied by about four per cent, with a narrower position increasing peak force and a wider position lessening the force needed to lift and lower the body.

As for gender differences, studies of pushups indicate that the percentage of body weight supported with the arms extended was similar for men and women. In the bent arm position however, peak force in men was higher, which researchers believe is because men carry more of their body weight in the upper body and women in their lower body. There may also be some mechanical differences in how the exercise is performed based on women having shorter arms and narrower chests than men. When the hands are placed on an elevated surface, the percentage of load supported by the upper body decreases. With the

arms straight and supported on a box 61 centimetres tall, the exerciser supports about 41 per cent of their body weight. Pushups performed with the feet elevated, however, increased the intensity of the exercise to about 74 per cent of body weight.

During suspension training using a TRX, the percentage of body weight changed significantly depending on the height (angle) of the straps. With the angle at zero per cent, the arms supported about 50 per cent of body weight. In the flexed (down) position, 75 per cent of body weight was supported.

It should be noted that more stress was placed on the spine during suspended pushups.

As for which pushup produced the greatest peak force, plyometric pushups are the most intense, with the clap pushup (pushing the body up with enough speed and power to clap both hands together before lowering the body back down toward the floor) requiring the most propulsive force.

All of these numbers give you not just a better idea of just how much weight you're lifting and lowering while doing pushups, but also just how much the intensity changes when the exercise is modified.

It's also a reminder why some people find pushups more challenging than others, given that body weight is a key determinant in the difficulty of the exercise.

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