Journal of Bodywork & Movement Therapies 22 (2018) 761–765

Contents lists available at ScienceDirect

Journal of Bodywork & Movement Therapies

journal homepage: www.elsevier.com/jbmt

PREVENTION & REHABILITATION: EDITORIAL

Strength matters

Strength is a skill and it is time that we prioritize it given the innumerable health benefits it provides to the body. In order to reverse society's inactivity epidemic, it is imperative that we find pain-free movements to challenge ourselves. Physical stress that is not excessive will lead to physical adaptation and we will emerge more resilient as individuals and as a society.

Think of osteoporosis that results when bones are not stressed, or cardiovascular disease if one lacks aerobic conditioning. Our muscles also require challenge in the form of resistance training to reduce disabling arthritis, prevent falls, and even minimize frailty.

Movement is how we express ourselves and it is what we were inherently designed to do! Our brain is the conductor of all movement and when challenged, it adapts and becomes more robust. Neuroscientist Daniel Wolpert is a leading researcher on motor control and states,

> "*We have a brain for one reason, and one reason only, and that's to produce adaptable and complex movements. Movement is the only way you have of affecting the world around you.*
>
> *Everything goes through contractions of muscles. Sensory memory and cognitive processes are important, but they are only important to either drive or suppress future movements.* (Wolpert, 2011)"

1. The role of smart strength

Strength provides physical stability that allows us to handle unexpected challenges more efficiently and safer. When you trip, do you recover your balance easily? As we age we lose this skill, but our muscles can be trained even in advanced age to reduce the devastating consequences of a fall.

If you enjoy running weekly and decide to increase your mileage from 2 miles a week to 6, are you prepared to tolerate this extra load? Have you developed strong, resilient muscles and fundamental movement skills that serve as a safety-net to increased loading and stress? This is why you must train!

Sports Scientist Dr. Mel Siff defined training as, "the process whereby the body is systemically exposed to a given set of stressors to enable it to efficiently manage future exposure to those stressors (Verkhoshansky, 2012)." The purpose of training is therefore clear - to prepare you for new or unforeseen stressors.

The benefits of strength training are multi-faceted, from increased performance to prevention of injuries (Lauersen Boet al, 2013) and certain diseases like osteoarthritis (Mcgrath et al., 2017). A large meta-analysis by the British Journal of Sports Medicine found strength training reduced sports injuries to one-third and cut overuse injuries in half (Lauersen Boet al, 2013). The protective nature of strength cannot be overstated.

In a systemic review and meta-analysis of data from 2 million men and women, the American Congress of Rehabilitation medicine found that, "Higher levels of upper and lower body muscular strength are associated with a lower risk of mortality in adult population, regardless of age and follow-up period (Garcia-Hermoso et al., 2018)." This is why the American Heart Association and the American College of Sports Medicine recommend moderate intensity resistance training at least two times a week (American Heart Association, 2014).

2. Training for strength

It is important to remember that the goal of training is to build you up, not break you down. You do not have to spend hours in the gym or train until you are in pain. Pick movements that deliver the highest return for the lowest risk. A plank is a great low-intensity core exercise but can you integrate that stability into a movement pattern or chaotic environment in order to increase overall motor control. A squat will check both of these boxes while providing a large stimulus to the entire body.

Also, there should be an emphasis on movement quality before quantity and coordination before strength. Every repetition is important and should be executed with this mindset. Exercise is stress, so it should be "slow-cooked" to allow for recovery from the stress and subsequent adaptation. Proper programming (not too much too soon or too little too late and relatable to a person's goals and weaknesses), sleep, and nutrition are crucial to facilitate this process.

Recent research has demonstrated that even sub-maximal loads can increase strength and hypertrophy (Schoenfeld et al., 2014). If tolerable, begin with accentuating the eccentric portion of the movement by following the maxim "lower slower." It is said that if you cannot put the weight down smoothly, you have not earned the right to lift it yet.

Eccentric contractions are involved in deceleration and transfer of elastic energy while the muscle is elongating (Franchi et al., 2017). This f promotes hypertrophy (Franchi et al., 2017), improves flexibility (more than static stretching) (O'Sullivan et al., 2012), and increases stiffness of the tendons, which can reduce the incidence of tendonopathies (Kay et al., 2016). Slowing movements down while under stress can improve motor learning and thus skill.

Therefore, the goals of strength training should be to:

- Work through comfortable ranges of motion, learning to control movement in these ranges.

https://doi.org/10.1016/j.jbmt.2018.06.001
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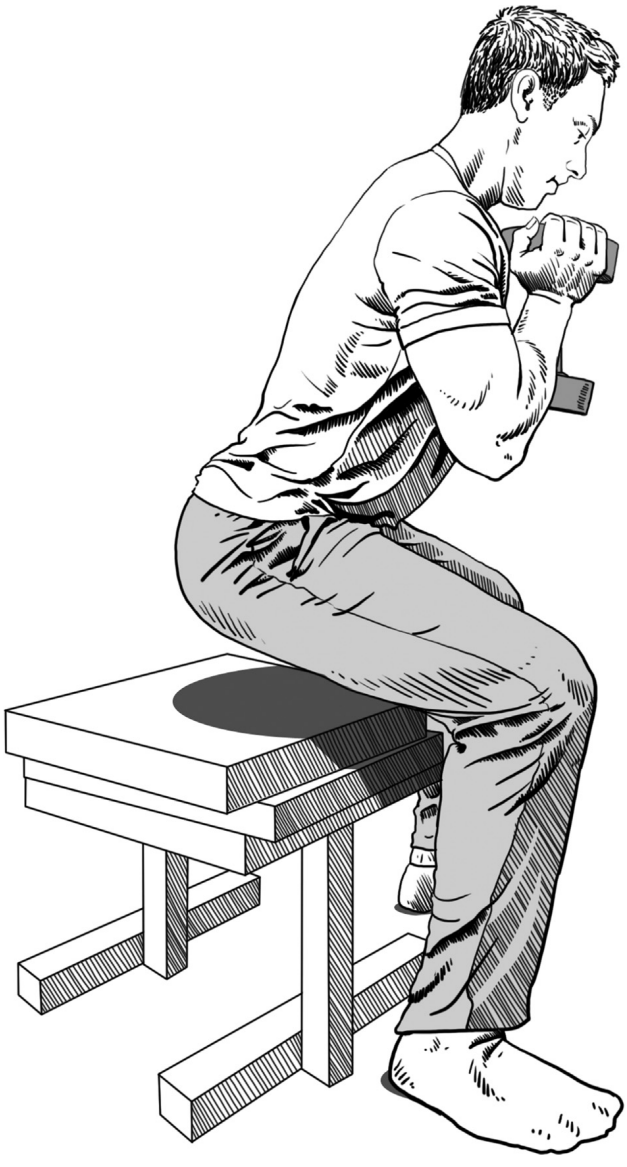

Fig. 1. Front loaded box squat (Dumbell goblet squat).

- Provide unique challenges, such as change angles, increase loads, increase time under tension, add more volume (total repetitions), and alter frequency.
- Progress or improve over time (progressive overload)
- De-load by reducing volume and/or intensity when necessary to promote recovery before the next round of stress
- Be mindful of your form. Have a qualified movement professional watch your form for proper biomechanics and postural considerations.
- Train in order to feel *good,* not get beat up.
- "A good workout should leave you with more than it takes away" (Pavel Tsatsouline, *Easy Strength*)

3. Front loaded box squat (Dumbell goblet squat)

The box squat is a very common lower-body exercise where you move from a standing position to a seated position on a box (or bench) back to a standing position with or without stress from added weight. This form of exercise can be completed with various box heights in order to vary the way it is executed, based on your lower extremity strength and flexibility. Most people can perform this movement safely and doing so helps reinforce proper squat technique while building the often weak hip extensors (gluteals, hamstrings).

If you have hip issues, then it is best to use a higher box. If knee pain, then sit back more and change the fulcrum so there is more stress on the hips and posterior chain and less on the quadriceps and knees. People who have long femurs (thigh bones) have deeper hip sockets (usually of Northern European descent) or lack anterior abdominal strength may excessively flex or bend at the spine to complete a free squat, which substantially increases the forces acting on the spine. The box squat allows you to keep a more neutral, upright spine and work in ranges that maintain postural integrity.

When performed properly, the box squat is a full body movement with a strong isometric contraction of the upper back to hold the weight and high activation of the anterior abdominals to stabilize the spine and stay upright (see Fig. 1). A few suggestions include the following.

- Set the box height appropriate for you
- Keep your feet outside the hips with the toes pointed slightly outward or have a professional determine the precise foot placement ideal for your hip anatomy and function
- Prepare for the repetition by stiffening the trunk and focus on this throughout the movement
- Grip the floor with your feet
- Initiate the movement at the hips and think about sitting back onto the box
- Attempt to spread the floor with your feet as you lower
- Sit back and all the way down, maintaining stiffness throughout abdominal/lumbar region
- Push off the box by extending through the hips

A box squat is not the same as squatting to a box where you tap and go. With a box squat you want to sit back, unload on the box, and then "explode" up. This breaks the eccentric-concentric chain and helps develop starting strength.

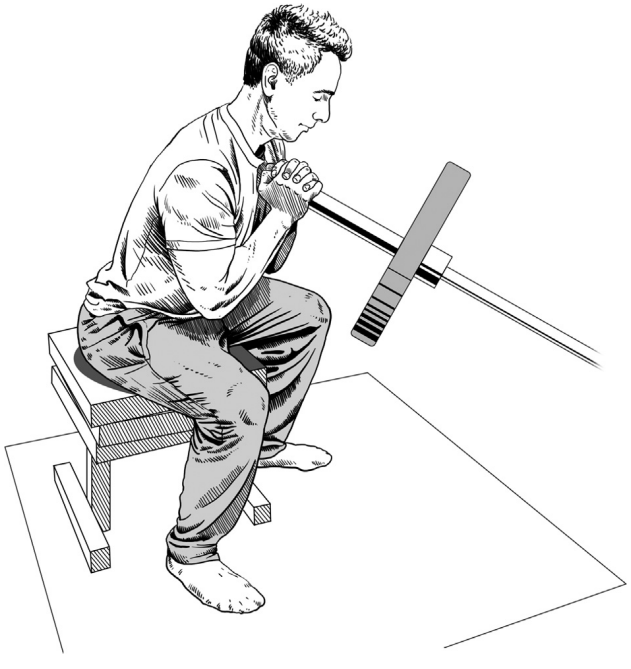

Fig. 2. Landmine box squat.

Fig. 3. Zercher box squat.

Tap and go is used more to focus on teaching or maintaining a specific depth. While you often see this used with beginners, I still think the traditional box squat is every bit as useful here. With tap and go you will often see people bounce off the box, while the sit and unload motion allows the movement to be more posterior dominant.

4. Additional front-loaded box squat variations

The traditional barbell back squat movement is a gold standard; however, it is not appropriate for everyone. Shoulder or spine issues may be aggravated, and some individuals may be uncomfortable with the positioning of the barbell on the shoulders or across the back. Fortunately, there are many alternatives to loading with this movement. Here are two unique ways to challenge the squat pattern.

Landmine Box Squat (see Fig. 2)
The Landmine Box Squat is a joint-friendly squat variation for beginner or experienced trainees where the bar is attached to the floor. The angle of the bar motion encourages you to sit back, load the posterior chain, and maintain proper upper body posture, making it a great movement to teach squat mechanics. It is also easier to hold than a traditional Dumbbell Goblet Squat so a heavier weight can be used in a safe manner.
Zercher Box Squat (see Fig. 3)

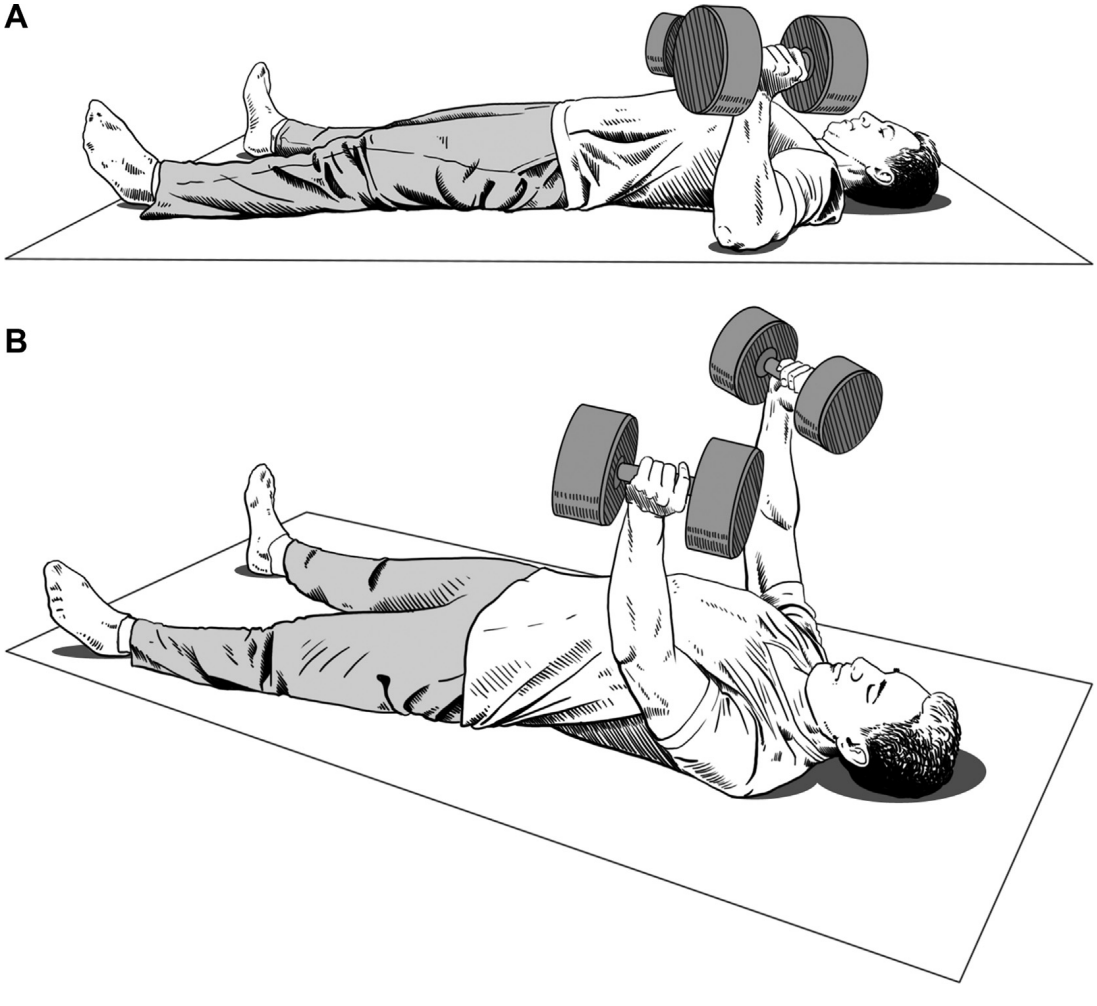

Fig. 4. Floor press (legs extended) a) bottom position b) top position.

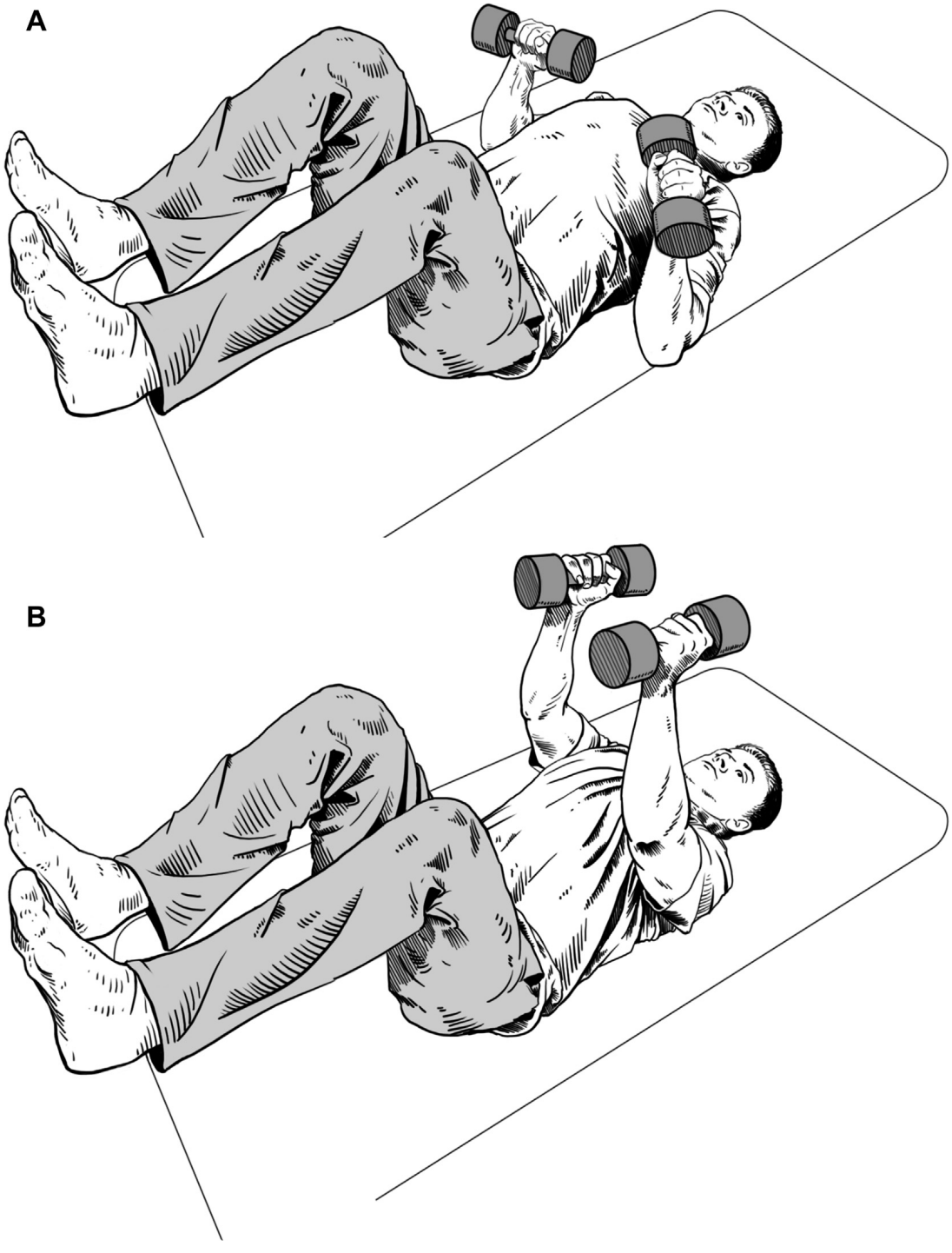

Fig. 5. Floor press (triple flexion) a) bottom position b) top position.

The Zercher Box Squat is an advanced squat variation for those who have mastered the Dumbbell and Landmine Squat. In this form of squat, the bar is held in the crease of the elbows, which requires assistance from the upper back (trapezius), anterior abdominals, and even the biceps. If performed with the appropriate trunk stiffness, this exercise will allow you to maintain a neutral spine and sit deeper than a traditional back squat.

5. Floor press

Individuals with shoulder pain often have poor scapular stability and dynamic control over the shoulder joint in general. The floor press is a very common upper-body strength training exercise and is literally completed by lifting a weight bar from a supine position on the floor. This position provides a stable base for the scapula and shortens the range of motion on the press, eliminating excessive anterior humeral slide.

Strengthening motions such as the floor press allows the upper body to produce and withstand forces through multiple planes and ranges of motion while focusing mainly on horizontal force production. Variations of the floor press include the dumbbell press (same position on the floor but use of dumbbells rather than a bar) or bench press (use of a weight bar while supine on a bench rather

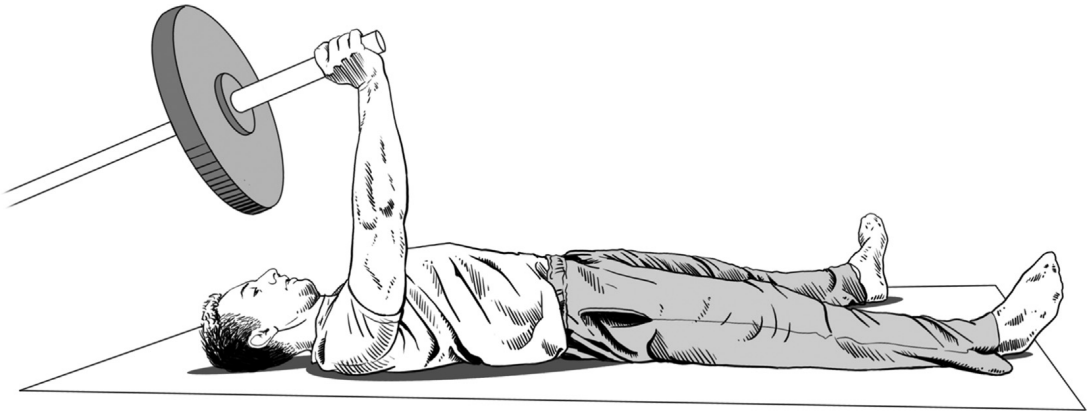

Fig. 6. Landmine unilateral floor press.

than on the floor). A few suggestions for press motions include the following:

- If you are on the floor, lay on your back with your legs straight Use a neutral grip to provide a more shoulder friendly experience
- Create tension through the upper back and grip the dumbbells intently
- Focus on pushing your shoulder blades back into the floor
- Lower the weight and pause on the floor (see Fig. 4a)
- Press yourself away from the weight (see Fig. 4b)
- A simple progression is to lift the feet up until the knees and hips are bent to 90° (triple flexion - hips/knees/ankles bent 90°) (Fig. 5a and b).

6. Additional floor press variation

The Landmine Unilateral Floor Press is a variation where one end of the weight bar is attached to the floor causing the lift to be more controlled. This modification also eliminates the repetitive pronated grip movement patterns (see Fig. 6). The neutral grip minimizes internal rotation and allows more room for the rotator cuff to glide through the acromion. The unilateral loading offers a beneficial anti-rotational component as well.

7. Conclusion

The front squat and floor press are fundamental examples of basic training elements. These are utilized to safely challenge a person with progressive stress so as to build strength progressively. The result is to prepare a person for sustainable activity and athleticism.

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