HEALTH BENEFITS OF STRENGTH TRAINING

An Eleiko Position Paper

ABSTRACT

Studies have demonstrated that strength training can improve health outcomes in a variety of ways. In this paper, we will examine the range of benefits that strength training can have for all kinds of people.

We will look at who strength training can benefit – this might be a wider demographic than you think! We will also see how strength training can have an impact on some of the most common health problems that people suffer from today.

Once you have read this paper, you will have the facts you need to make a case for strength training in everyone's fitness program.

HEALTH BENEFITS OF STRENGTH TRAINING

STRENGTH IS NOT JUST FOR ATHLETES!

The advantages of greater strength have long been recognised by athletes across many sports, even those in which maximal strength is not the most important quality. However, a much wider range of people can benefit from strength training. Virtually the whole population can become healthier by including strength work in their regular exercise.

As we will see later in this paper, strength training brings with it a host of secondary effects alongside gaining muscle mass. These can help to prevent the most harmful diseases of our time, or to mitigate their consequences (Mcleod et al., 2019; Wescott, 2012). There is even evidence that regular strength training reduces all-cause mortality. To put it another way – *strength training can help you live longer* (Kraschnewski et al., 2016).

Despite the growing body of evidence and government recommendations, strength training still lags behind other forms of exercise in the public consciousness. Only around 30% of USA adults complete the recommended two sessions of strength training per week and nearly 60% do no strength training at all (Bennie et al., 2018) Results for other developed economies are similar (Health Survey for England, 2016)

Given the benefits of strength training that we will explore in this paper, it is shocking that such a small proportion of the population are taking advantage of a very affordable and time-efficient way to improve their health. It is also an opportunity for the strength community to have a huge impact on public health by convincing more people to start and continue training.

We are all responsible for sharing the knowledge that will enable more people to reap the benefits of good strength training. That might involve explaining the reasons why this form of exercise is so effective, or perhaps overcoming some of the objections that those unfamiliar with it may have. Whatever it is, we can all play our part in helping everyone to become stronger physically, mentally and medically.

WHAT STRENGTH TRAINING DOES

One of the most apparent effects of strength training is an increase in muscle mass ("Progression Models in Resistance Training for Healthy Adults," 2009). Since muscle mass consumes energy even at rest, this can bring with it an increase in the resting metabolic rate (Van Etten et al, 1997; Zurlo et al., 1990).

Other adaptations in the muscles are not so apparent but are no less important. An increase in the number and size of the mitochondria that generate energy in the cells of the muscles further contributes to metabolic changes (Groennebaek & Vissing, 2017). Connective tissue becomes more resilient (Brumitt & Cuddeford, 2015), and even bones gain density (Hong & Kim, 2018).

Outside of the muscles, hormonal responses of a variety of types take place as a result of strength

training. Of particular interest for general health are those around insulin signalling, which have direct consequences for reducing the risk of type 2 diabetes (Mcleod et al., 2019).

The nervous system shows some of the most rapid and striking adaptations to the stimulus of resistance training. These can lead to greater efficiency in using muscles, improved balance, and reduction in chronic pain. The benefits can be especially stark for older people, for who slowing the loss of motor neurons can be critical in maintaining functional capacity (Aagard et al., 2010).

While the mechanisms are not yet fully understood, studies have demonstrated that strength training improves cognitive and mental health (O'Connor et al., 2010).

It only takes four to eight weeks for the physiological effects of strength training to become apparent, so even a relatively short programme of strength work can deliver appreciable adaptations which can remain with a client for a significant time ("Progression Models in Resistance Training for Healthy Adults," 2009).

STRENGTH AND OBESITY

Worldwide obesity has nearly tripled since 1975. Most of the world's population now lives in countries where being overweight kills more people every year than being underweight (World Health Organisation).

The traditional approach to losing fat is to adjust diet to reduce calorie intake while increasing calorie expenditure by increasing exercise, typically with aerobic training. While this strategy does work to some extent for many people, it may not be optimal and may even introduce some problems.

Weight loss can cause a reduction in bone density (Hunter, Plaisance & Fisher, 2014) and muscle mass (Beavers et al., 2017), especially in older people. This can mean that health improvements from fat loss are offset by other problems.

The kind of steady-state cardio exercise typically used to burn calories does not work well for everyone. Maybe they don't enjoy it or it could be that the need to increase the duration of exercise as the body adapts to the stimulus makes it too time-consuming in the long run.

There is evidence that incorporating strength training can deliver better results for fat loss than just using diet and aerobic exercise (Bea et al., 2010).

Strength training can contribute to fat loss in several ways. While the calories used by resting muscle are often overstated, muscle does use around three times as much energy as the equivalent mass of fat. Studies have demonstrated the resulting increase in long term resting metabolic rate (Van Etten et al, 1997). In addition, strength training increases excess post-exercise oxygen consumption (EPOC) more than steady-state cardio exercise (Greer et al. 2015). This means that the body will use even more calories for a period of up to two days after training.

In addition to contributing to fat loss, strength training can reduce or even reverse reduction in bone density and muscle mass caused by weight loss (Villareal, 2017). This makes it especially valuable when working with older clients who will be prone to these effects.

STRENGTH TRAINING AS MEDICINE

By tackling obesity and improving overall health, strength training can reduce the risk of a wide range of diseases. It can also bring specific benefits for those at risk of certain conditions.

Hypertension

Long-term high blood pressure is a risk factor for many diseases with high mortality rates in developed nations. These include heart disease, strokes and kidney disease. High blood pressure in mid-life has also been linked with the risk of some forms of dementia later in life (Sharp et al., 2011).

Multiple trials have found that strength training is an effective way to manage hypertension (Cornelissen et al., 2011). Blood pressure increases during and just after exercise but several adaptations are induced, which reduce blood pressure in the long term.

Regular exercise causes a reduction in the level of norepinephrine. This neurotransmitter causes several effects that contribute to high blood pressure, including an increase in heart activity and vasoconstriction (narrowing of blood vessels). Within the vascular system itself, vasodilation (the widening of blood vessels) is promoted, along with other physical changes. There is also an anti-inflammatory effect of exercise that can act to avoid high blood pressure. (Ghadieh and Saab, 2015).

Medications exist which can cause all of these effects but they bring side effects with them. Exercise can be used to reduce the need for pharmaceutical intervention, providing a cost-effective and safe way to prevent hypertension and to treat it (although in some cases, medication may be required) (Lemes et al., 2016)

Type 2 Diabetes

Lifestyle factors such as a poor diet, high body fat percentage and lack of exercise can lead to insulin resistance and consequently high blood sugar levels. Elevated blood sugar is a risk factor for many dangerous conditions.

Increasing muscle mass can improve metabolism and thus reduce insulin resistance (McPherron et al., 2013). There is some evidence that, while endurance training creates some beneficial metabolic adaptations, increasing fat oxidation can sometimes worsen insulin resistance. Training fast glycolytic muscle fibres rather than slow oxidative fibres means that more fuel is being consumed anaerobically. So, strength training that targets fast-twitch fibres may confer the benefits without the downsides.

These benefits appear to be especially valuable as people age. Sarcopenia (loss of muscle mass) puts older people at an increased risk of type 2 diabetes, but endurance exercise may not be possible. Strength training is accessible to everyone and can help to maintain muscle mass (Flack et al., 2010).

Metabolic Syndrome

When several risk factors combine, including obesity, hypertension and high blood sugar, metabolic syndrome is the result. The effect is a significantly increased risk of heart disease and type-2 diabetes.

As we have seen, strength training can help to tackle obesity and high blood pressure, which are key components of the syndrome. Studies have shown that strength training can reduce mortality from heart disease and strokes in sufferers (Lemes et al., 2016).

Cancer

Higher levels of muscular strength are associated with a lower risk of death caused by cancer (Ruiz et al., 2009). Regular strength training is linked to reduced cancer mortality (Stamatakis et al., 2017).

There are several proposed mechanisms for greater strength to be associated with a lower risk of dying of cancer. We have already seen how strength training can contribute to a reduction in conditions that can lead to metabolic syndrome (obesity, hypertension and type 2 diabetes), which is a significant risk factor for many types of cancer. In addition, strength training can provide additional benefits that directly impact cancer risk.

Insulin resistance and high insulin-like growth factor (IGF) levels are associated with an increased risk of some kinds of cancer. As we saw earlier, strength training can lead to metabolic improvements around insulin sensitivity. Strength training increases levels of a protein which binds to IGF and reduces the cancer risk associated with it (Yu, 2000).

The long-term anti-inflammatory effect of strength training may also have an impact on cancer risk (Visser et al., 2002). The immune system may also benefit from strength training, assisting the body to resist cancer (Simonson and Jackson, 2004).

Survivors recovering from cancer can also benefit from strength training (De Backer et al., 2009). This is likely through the same mechanisms that were discussed above.

Chronic Pain

It is ironic that many people wrongly associate strength training with back pain. On the contrary, studies have shown that it can be useful in preventing conditions that can lead to back pain and in reducing existing symptoms (Hayden et al., 2005). It is thought that the main benefit is from strengthening the muscles that surround the spine (Dreisinger, 2014).

Osteoarthritis causes joint pain due to the breakdown of cartilage in joints. Strengthening exercises are effective in reducing symptoms and slowing their progression (Pelland et al., 2004).

Fibromyalgia is a condition of unknown cause that can lead to widespread pain, fatigue and other symptoms. Strength training can be effective in reducing many of the symptoms, leading to increased functional capacity and improved overall quality of life (Andrade et al., 2018).

PHYSICALLY STRONG, MENTALLY STRONG

Mental health conditions regularly affect up to 15% of the population (McManus et al., 2014). The problems associated with the pharmaceutical treatment of conditions such as depression have motivated healthcare practitioners to seek out alternative approaches.

The use of strength training to tackle cognitive and mental health is still relatively in its infancy. However, there is already a growing evidence base and some exciting practical applications of it.

There is particular promise in using strength training to treat depression. There is good evidence that physical activity in general (Rebar et al., 2014) and strength training in particular (O'Connor et al., 2010) have a significant effect on reducing symptoms of depression. Anxiety is another common mental health issue that has been shown to be mitigated by strength training (O'Connor et al., 2010).

The mechanisms by which this happens are not well understood, but a combination of social, psychological and neural effects combine to create the observed benefits.

Several studies have found significant effects of strength training on general cognition function (Herold et al., 2019). Although more work is needed to confirm the benefits more precisely, strength training does seem to impact the health of the brain and to help in maintaining cognitive function.

Sleep

There is evidence that the duration and quality of our sleep can affect our health in many ways. There is also some evidence that strength training may improve quality of sleep and help people to get the right amount of sleep for them (Alley et al., 2015)

STRENGTH FOR ALL AGES

One of the most common misconceptions around strength training is that it is for the young. The truth is that older people have, if anything, even more to gain from resistance exercise.

The most obvious reason for everyone to do strength training as they get older is to maintain muscle mass, and indeed there is good evidence for this (Bea et al., 2010). However, strength training can also help in many other ways to offset the effects of ageing.

As well as maintaining or even increasing muscle mass, strength training improves the efficiency with which the nervous system activates muscles (Mayer et al., 2011). There is evidence that this leads to a reduction in the risk of falls (Clemson et al., 2012).

Strength training can also help to maintain more general neural function (Liu-Ambrose et al., 2010) and even lead to improvements in those with impairments (Nagamatsu et al., 2012).

Bone density losses through osteoporosis can be reduced and even reversed with strength training (Mosti et al., 2013) and studies have demonstrated similar benefits for those suffering from osteoarthritis (Latham and Liu, 2010)

As we mentioned earlier, despite a common myth that strength training leads to back pain, the opposite is true. Regular training strengthens the muscles that support and protect the spine. It can also improve posture, reducing chronic pain (Ochsner, 2014).

RECOMMENDATIONS FOR STRENGTH TRAINING

Many governments and non-governmental organisations have published broadly similar guidance on strength training. The overall guidance is that generally healthy adults should perform exercises to strengthen major muscle groups at least twice per week.

Strength training can take many forms, including free weights, machines and bodyweight exercises. There is evidence that, if it is possible to use them, free weights bring greater health benefits than using machines or unloaded exercises. As well as greater muscle mass, strength and balance gains (Spennewyn, 2008), there appears to be a more significant hormonal response to free weight training (Aaron et al., 2014)

The ability of strength training to be easily scaled to the capabilities of the client means that it is accessible to all kinds of people. There is no reason why everyone can't meet and exceed the recommended two training sessions per week. Sadly, as we mentioned earlier, only a minority of adults do this. It is up to us to change this and bring all of the benefits we have discussed to as many people as possible!

SUMMARY

In this paper, we have seen that strength training can confer a multitude of health benefits.

The key points are:

- Strength training can mitigate a range of common diseases and risks
- Strength training can help you live longer
- Strength training is accessible to everyone

You should now be armed with some great justifications for people to begin or continue strength training. Hopefully, you will now be able to share this knowledge and make a difference to the lives of the people around you.

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