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BETTER INSULIN SENSITIVITY

Photo taken from Technogym website

Insulin resistance refers to the reduced ability of uptake of glucose within skeletal muscle and the inability to suppress endogenous glucose production. It reduces the rate of glucose uptake which limits the ability to exercise and leads to the buildup of glucose (hyperglycaemia) and insulin (hyperinsulinaemia) in our blood stream which affects our overall health, increases the rate of fat deposition and makes it much harder to lose fat.

It is believed that insulin resistance is the first development of Type 2 diabetes, cardiovascular disease and polycystic ovary syndrome. The actual pathology of insulin resistance is still unclear. However, it is believed that it is the excess accumulation of subcutaneous and abdominal fat that contributes to the reduced sensitivity of insulin receptors.

Evidence has shown that lifestyle modifications including healthy eating and physical activity have produced positive effects in insulin resistance.

Although dietary modifications or weight loss through caloric restrictions may also improve insulin resistance, exercise seems to have greater effect on insulin action. Moreover, chronic exercise stimulates mitochondrial oxidative capacity which suppresses excessive endogenous glucose production.

NOT JUST ANY EXERCISE

However, there is a general misconception that any increase in physical activities can improve insulin sensitivity. Reviews on existing evidence have shown that the exercise we performed has to be specific to achieve optimal effects on insulin sensitivity.

As early as the 1980s, researchers had already proved that a single dose of high intensity exercise can improve insulin resistance. However, a later research demonstrated that a single dose of continuous low or moderate intensity aerobic exercise can also enhance peripheral insulin sensitivity and fatty acid uptake. In that research, both lower-intensity (50% Vo2peak) group and moderate-intensity (65% Vo2peak) group exercised till they expended 350 kcal.

In other words, the lower-intensity group had to exercise longer than the moderate group to achieve the 350 kcal energy expenditure.

Surprisingly, they found that the lower-intensity group achieved better effect on insulin sensitivity than the moderate-intensity group. They concluded that it was the group that performed greater weekly volume that exhibited greater improvement.

This leads us to question if we can accumulate our physical activities throughout the day as suggested by the American College of Sports Medicine to achieve the 350 kcal of energy expenditure.

SHORT BOUTS OR CONTINUOUS?

A recent study in Singapore compared the effects of 30 minutes of brisk walking in short bouts of 10 minutes each and 30 minutes of brisk walking continuously. Interestingly, they found that only the group which exercised continuously for 30 minutes exhibited an increase in insulin sensitivity. It seems that short bouts of exercises with short rest in between (Interval training) are more effective when performed in high-intensity (i.e. HIIT) where heart rate remains high during the resting period. Despite getting insulin sensitivity enhancement with just a single bout of exercise, the effect also diminishes quickly.

> A single bout of aerobic activity that lasts 30 minutes or more in moderate intensity (e.g. brisk walk) is enough to enhance insulin action for up to 16 hours.
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> Adding resistance exercises such as weight lifting can provide additional and more sustainable benefits on insulin sensitivity through building or preserving lean muscle mass and improving muscle metabolism.

BED REST

Earlier research had shown that just three days of bed rest reduces insulin sensitivity by about 17-30%. A recent study showed that just a single day of sitting that lasted 17 hours reduces insulin sensitivity by the same magnitude as three days of bed rest.

REDUCTION IN EXERCISE

Another study that observed the effects of non-exercising individuals that reduces their daily physical activities from 10,000 steps a day to less than 2,000 steps a days (about 85% reduction) found a reduction of insulin action by about 17% after two weeks. Surprisingly, they also observed parallel reduction of about 2.8% of lean muscle mass in the leg and a suppression of about 7% of cardiovascular fitness.

The researchers concluded that it might be the combination effect of losing insulin sensitivity, lean muscle mass and cardiovascular fitness that contributed to the declines in metabolic function. In all, it shows that exercise should not only target the metabolic function but also cardiovascular fitness and building or maintaining of lean body mass.

STRENGTH TRAINING

Strength training or so called resistance training is proven to be the most effective way to build or maintain lean muscle mass. Increase in muscle mass also increases the capacity of glycogen storage. Studies have shown that strength training that increases lean muscle mass with or without weight loss improves insulin resistances especially hepatic insulin resistance. Strength training consisting of about 10 exercises two to three days per week for two sets of eight to 12 repetitions have shown to be enough to improve insulin action even in older adults. For those who preferred to combine aerobic and strength training in a single session, five strength training exercises involving large muscle groups such as chest press, leg press, latissimus pull down, gluteal press and leg curl have shown to improve insulin action and concurrently reduces abdominal fat and increases lean muscle mass after 16 weeks. However, men seem to be able to achieve greater effects on insulin resistance than women with the same strength training protocol. The reason for gender difference in training effect is still nebulous.

In summary, insulin resistance has been associated with numerous health risk and blood glucose control in diabetes. At the moment, the best practice is to combine dietary approach together with the right amount of exercises.

Current evidence seems to show that the effects on insulin sensitivity depend more on the volume of exercise instead of intensity. A single bout of aerobic activity that lasts 30 minutes or more in moderate intensity (e.g. brisk walk) is enough to enhance insulin action for up to 16 hours. Adding resistance exercises such as weight lifting can provide additional and more sustainable benefits on insulin sensitivity through building or preserving lean muscle mass and improving muscle metabolism.

Hence, moving the body more frequently for longer durations and engage in some resistance exercises weekly can help us maintain a healthy glucose metabolism.

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