



CARDIOVASCULAR FITNESS & DIABETES

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Exercise is physical activities that stress the targeted components of personal fitness so to achieve our fitness goals.

The five most important components of personal health fitness are cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. Among them, cardiovascular fitness is said to be the most important component as it affects other components and thus, overall activity.

Cardiovascular fitness itself has a direct positive effect on our muscular endurance and indirectly affecting our muscular strength and flexibility.

Cardiovascular fitness refers to the ability of our heart, lungs, blood cells, and muscles, working together to transfer and absorb oxygen and nutrients, and expel carbon dioxide and other debris for efficient energy production through a process called energy metabolism. Energy production requires fuels such as carbohydrates and fats. When oxygen is insufficient, we can only produce energy from carbohydrates that lasted a short duration. When oxygen is abundant, we can metabolise both carbohydrate and fat to produce energy that last longer duration. In another words, to improve our body's utilisation of fuel to fight diabetes and maintain a healthy body composition, training both aerobic and anaerobic components of our cardiovascular fitness is needed.

Aerobic exercises are prolonged exercises that are less intense. Physiologically, this mode of exercise expends more fat than carbohydrate. The acute effect of this mode of exercise is reducing blood sugar gradually. The chronic effect of this exercise is improved HbA1c, improved blood pressure, and increased tissue oxygen supply during exercise (improved endurance). Other effects of chronic aerobic exercise include improving lipid profile, body composition and mood. Some examples of such activities are walking, dancing, jogging, cycling and swimming. The current guideline is to achieve 30 minutes of such activities at least five times a week in moderate intensity to maintain health. To fight diseases such as obesity and diabetes, we recommend 60 minutes. The most accurate way to determine intensity is by measuring heart rate.

However, it is not always convenient to check our heart rate while exercising unless we wear a heart rate monitor. A more general and convenient way to make sure we exercise in moderate zone is the ability to complete 3.2km in 30 minutes. If we are not able to complete 3.2km in 30 minutes in one go, we can accumulate the 30 or 60 minutes of moderate exercise over an interval bout of 10 minutes or throughout the day. We can further create two-minute intervals within the 10 minutes bout if we are not able to complete 10 minutes in one go.

Here is a summary of the workout plan. Work towards 60 minutes gradually when you feel more confident and easy. Usually, it will take about two weeks before you start to see some improvements.

Plan	Repetitions per Session	Sessions per Day
1	2-min bout 5 times with 2-4 mins rest	3-6
2	10-min bout 1-6 times with 5 mins rest	6-1
3	20-min bout 1-2 times with 5 mins rest	2-1
4	30-min bout	1-2

Target a total of about 150-300 minutes per week of exercises in aerobic mode.



Anaerobic exercises are exercises that are short and intense. The shorter the bout of workout, the more intense it should be to be effective. Physiologically, the tissue demand of oxygen exceeds the amount of oxygen our body can supply. To continue exercising, our body has to depend on carbohydrate for anaerobic metabolism to produce energy. This mode of exercise expends mainly carbohydrates and does not last long. It lowers blood sugar quickly. The acute effect of this mode of exercise is that it reduces blood sugar quickly. There is also a high chance of blood sugar rebounding or going up due to the recycling of pyruvic acid (a by-product of anaerobic metabolism) back to carbohydrates for energy production. However, the rise is temporary and blood sugar will return to normal shortly after exercise.

The chronic effect of anaerobic exercise is improved blood sugar sensitivity, metabolic rate, muscular strength and endurance. It further improves HbA1c when combined with aerobic exercises. Some examples of this exercise mode are weight training with short rest, running, sprinting, bicycle sprinting, and brisk climbing of stairs. The most common form of anaerobic training program is the High Intensity Interval Training (HIIT). Current guidelines encourage 20 minutes of HIIT at least two times per week. Below is a summary of the workout plan. Work towards 60 minutes gradually when you feel more confident and easy. Usually, it takes about two weeks to feel stronger but takes about six to eight weeks to actually see effects.

Plan	Type & Repetitions per Session	Sessions per Week
1	Weight training Progress from 4 to 8 exercises, 10 repetitions, 3 sets with 1-2 minute rest between sets. Select weights that you can only do 12-14 repetitions or about 65% of your maximum strength.	2
2	Sprinting, stationary bike, cross trainer, rower machine 30 seconds all out, 30 seconds active rest (very slow) x 10 repetitions (10 minutes) x 1-2 sets	2-4
3	Treadmill Incline 6 -10%, brisk walk at >5km/h 2 min walk, 1 min rest (stop or at very slow speed) x 1 set	2
For weight exercises, select exercises that engage large muscle groups, preferably multi-joints.		

Always start an exercise regime at a slower pace, shorter duration and lower intensity. As fitness improves, progress gradually. Remember to do proper warm-ups, cool-down and recovery exercises such as stretching before and after each session to prevent injury.