

Chapter 5: HIIT for Endurance



S1: In this video, we'll talk about HIIT for endurance.

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- The functioning of the heart can be measured by three determinants

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1. Heart Rate

- This is the rate of your heart beating per minute
- The more your heart beats in a minute, the more blood is pumped to the body and the faster your body moves towards endurance

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2. Stroke Volume

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3. Contractility

- The stronger the force, the farther the blood travels
- If contractility is higher, an individual has more blood flowing to the exercising muscles
- This blood is laden with oxygen and nutrients that are then utilized by the skeletal muscles for strength and repair

S7:

3. **Contractility**

This refers to the force with which your heart pumps blood to the body. The stronger the force, the farther the blood travels. If contractility is higher, an individual has more blood flowing to the exercising muscles. This blood is laden with oxygen and nutrients that are then utilized by the skeletal muscles for strength and repair.

- Endurance is not only a measure of how strong your heart working is
- It also refers to the amount of oxygen that can be delivered to your muscles
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- Not all the oxygen that is taken to the muscles by the blood is taken by the muscles
- The oxygen has to be extracted first and the more oxygen extraction capacity the muscles have, more oxygen they will receive

S9: This variable depends on the factors mentioned earlier as well as on the amount of oxygen that is extracted from the blood that enters the muscles. Not all the oxygen that is taken to the muscles by the blood is taken by the muscles. The oxygen has to be extracted first and the more oxygen extraction capacity the muscles have, more oxygen they will receive.

- Another factor that contributes to endurance is the mitochondrial density
- What this means is that it is involved in the production of energy in the form of ATP
- This energy is produced through different cycles that take place in the mitochondria
- The higher the mitochondrial density, the more energy is produced for the consumption of the body

S10: Another factor that contributes to endurance is the mitochondrial density. It is common knowledge that mitochondria is the power house of the cell. What this means is that it is involved in the production of energy in the form of ATP. This energy is produced through different cycles that take place in the mitochondria. The higher the mitochondrial density, the more energy is produced for the consumption of the body.

How Does HIIT Build Endurance?

- It enhances the stroke volume for ensuring a greater amount of blood flow to the skeletal muscles
- Moreover, it also has an effect on contractility and increases the pumping force of the heart

How does HIIT build endurance?

S11: HIIT builds endurance by working on all the variables that are mentioned earlier. It enhances the stroke volume for ensuring a greater amount of blood flow to the skeletal muscles. Moreover, it also has an effect on contractility and increases the pumping force of the heart.

- As far as mitochondrial density is concerned, HIIT is a great alternative to aerobic exercises for increasing your mitochondrial density
- If there are more mitochondria in the body, more energy production takes place and that gives the muscles more endurance

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- Another way in which HIIT induces endurance is by increasing the number of enzymes present in the mitochondria
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- These enzymes have their distinctive activities that are essential for energy production
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S15: When you do HIIT, it shifts the signalling pathway in the body from a slower to a faster one. For breakdown of nutrients and extraction of energy from them, the mitochondria are activated through a 'switch' in the body called PGCα. During high intensity exercises, the signalling pathway for activation of this switch is a faster one. As a result of that, the enzymes' activity is enhanced and the mitochondrial density is also increased.

HIIT and VO₂

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As mentioned earlier, the VO₂ levels in the blood determine how much oxygen is getting to the skeletal muscles and other parts of the body. HIIT has shown to significantly enhance VO₂ levels in the body and enhances stroke volume. Since the stroke volume is enhanced through high intensity workouts, more blood gets

sent to the body every single time the heart contracts. This is a good thing for the skeletal muscles since they start getting more blood.

- The circulatory system of the body is responsible for transport of nutrients and oxygen to the muscles and other organs
- When the skeletal muscles get more blood, they also get more oxygen and nutrients
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- High intensity workouts also increase cardiac contractility which refers to the force with which the heart pumps blood
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- When skeletal muscles get more blood, they build up endurance
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HIIT Builds Endurance In Skeletal Muscles

- High intensity workouts also build endurance in skeletal muscles
- When you perform these exercises, the vasculature of the skeletal muscle is changed
- Due to these workouts, tiny blood vessels become apparent in the skeletal muscles

S21: High intensity workouts also build endurance in skeletal muscles. When you perform these exercises, the vasculature of the skeletal muscle is changed. The vasculature refers to the size and number of blood vessels that are present in the area. Due to these workouts, tiny blood vessels become apparent in the skeletal muscles.

- They enhance the heart stroke by sending more blood to the heart
- The muscles, when contracting, send blood back to the left ventricle of the heart
- If more blood is being sent to the heart, it means more blood is being oxygenated too

S22: They enhance the heart stroke by sending more blood to the heart. The muscles, when contracting, send blood back to the left ventricle of the heart. If more blood is being sent to the heart, it means more blood is being oxygenated too. Thus, heart stroke is enhanced and more blood is sent back to the body in oxygenated form. This increases the amount of nutrients getting to the muscles.

- HIIT also enhances endurance by increasing the strength of muscle fibres
- The muscles fibres are made up on proteins
- In high intensity workouts, the blood circulation is enhanced and more of these proteins are being made using the amino acids present in the blood
- This enhances the flexibility of the muscle fibres and makes them stronger

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Motor Units and HIIT

- If more motor units are present in the skeletal muscles, then muscle coordination is much better and the person has more endurance
- Motor units also help to reduce the fatigue time for exercises. As such, anyone with enhanced motor units does not tend to get tired quickly.

Motor units and HIIT

S24: The skeletal muscle fibres have something called motor units. These units are important for signalling in the muscles and for building endurance. High intensity workouts increase the number of motor units present in the body. This can aid in two things.

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Does HIIT Affect Qmax?

- Qmax is referred to the maximum amount of blood that your heart can pump to the body in a minute
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- HIIT takes cardiovascular pathways to increase endurance
- It increases the density of mitochondria in the cells along with enhancing the functioning of mitochondrial enzymes
- Furthermore, it strengthens the muscle fibres by giving them more proteins for repair and strength

S26: Therefore, HIIT takes cardiovascular pathways to increase endurance. It increases the density of mitochondria in the cells along with enhancing the functioning of mitochondrial enzymes. Furthermore, it strengthens the muscle fibres by giving them more proteins for repair and strength.

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