

Exercise Therapy

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Difference between Aerobic Exercise & Anaerobic Exercise

Aspect	Aerobic Exercise	Anaerobic Exercise
Definition	Exercise that relies primarily on oxygen-dependent (aerobic) metabolism to produce energy for sustained activity.	Exercise that relies primarily on energy sources that do not require oxygen for immediate ATP production.
Energy System	Oxidative (aerobic) energy system.	ATP-PC system and anaerobic glycolytic system.
Oxygen Requirement	Requires adequate oxygen supply to working muscles.	Energy is produced faster than oxygen can be supplied; oxygen is not the primary energy source.
Duration of Activity	Can be maintained for prolonged periods (minutes to hours).	Usually maintained for short periods (seconds to a few minutes).
Exercise Intensity	Low to moderate intensity.	High to very high intensity.
Primary Fuel Sources	Carbohydrates and fats.	ATP, phosphocreatine (PCr), and glucose/glycogen.
Rate of ATP Production	Slower ATP production but large capacity for sustained energy.	Rapid ATP production but limited capacity.
By-products	Produces carbon dioxide and water.	Produces lactate (during anaerobic glycolysis) and metabolic by-products associated with fatigue.

Muscle Fiber Recruitment	Primarily Type I (slow-twitch) fibers.	Primarily Type II (fast-twitch) fibers.
Fatigue Rate	Fatigue develops slowly.	Fatigue develops rapidly.
Cardiovascular Response	Significant increase in heart rate, stroke volume, and oxygen delivery over sustained periods.	Rapid cardiovascular response but activity duration is limited.
Training Adaptations	Improves cardiorespiratory endurance, mitochondrial density, capillarization, and aerobic capacity.	Improves strength, power, speed, anaerobic capacity, and neuromuscular performance.
Examples	Walking, jogging, cycling, swimming, rowing, aerobic dancing.	Sprinting, jumping, heavy resistance training, power lifting, short-duration high-intensity interval activities.
Primary Goal	Enhance endurance and cardiorespiratory fitness.	Enhance power, strength, speed, and high-intensity performance.

Ref: Kisner, C., Colby, L. A., & Borstad, J. (2018). Therapeutic Exercise: Foundations and Techniques (7th ed.). Philadelphia: F.A. Davis. (Chapter on Physiological Responses to Exercise and Aerobic Conditioning)

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