



# Physiology Team 432



## Tenth Lecture: Sport Performance

**DONE AND REVIEWED BY:**

**Khulood Al-Raddadi & Mohammad Jameel**

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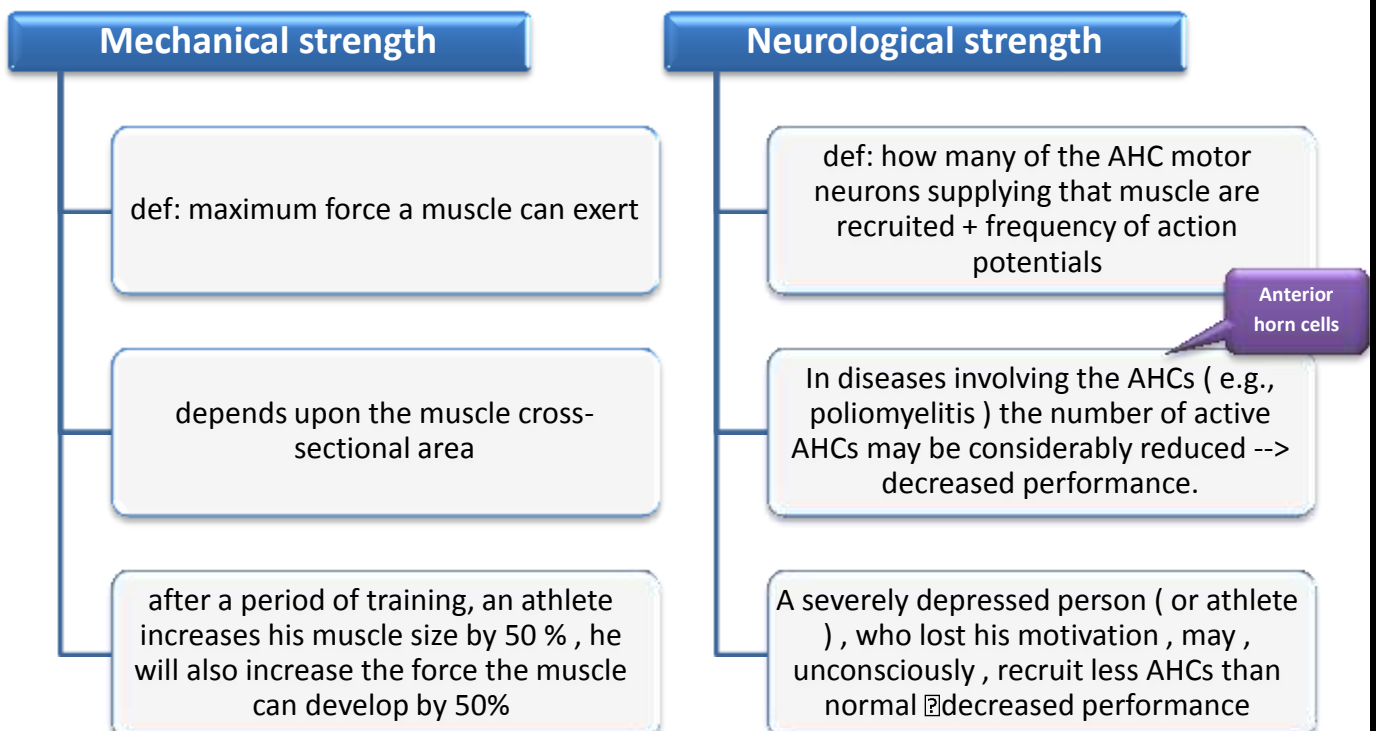
# Sport Psychology

The study of the psychological factors that affect participation and performance in sports.



- Sports are most often played just for fun or for the simple fact that people need exercise to stay in good condition.
- Professional sport is a major source of entertainment.

## **Muscle Strength** قوة العضلة



## شغل العضلة Muscle Power

- When muscles contract or stretch in moving a load they do **work**, and energy is transferred from one form to another.
- The “**power**” of muscles refers to how quickly the muscles can do this work and transfer the energy.

$$\text{الشغل} \quad \text{Work} = \text{Force} \times \text{Distance}$$
$$\text{الطاقة} \quad \text{Power} = \text{Work} / \text{Time}$$

The shorter the time used to perform a piece of work → the more power is needed  
Hence , if a weightlifter lifts a given weight explosively over a short time ( say 0.5 seconds )  
he needs his muscles to produce much more power than if he did that while taking more  
time (say 3 sec).

كلما قل الوقت المطلوب لاداء شغل معين كلما ازداد مقدار الطاقة المطلوب لذلك، مثال: لو طلب من رافع الانتقال ان يرفع وزن معين في ٠,٥ ثانية فإذن ذلك سيتطلب منه بذل مجهود اكثر مما لو طلب منه ذلك في ٣ ثوان.

## Energy Availability

- When humans utilize energy to perform muscular exercise , the energy is expended to :\_  
(1) doing work & (2) generating heat .  
الطاقة المخزنة في العضلات تستنفذ اثناء الرياضة في : اداء العمل، انتاج الحرارة.
- For short-term , intense exercise e.g., when the person is jumping up from a squatting position , energy expenditure can be much more than for long-term exercise .  
يكون استهلاك الطاقة في الرياضات القصيرة المدى مثل القفز اكثر من الرياضات الطويلة كالمشي.

## Energy Sources

- (1) Energy needed to perform (**short-lasting, high-intensity**) bursts of activity is derived from **anaerobic sources** within the cell.
- (2) mild-moderate intensity long term (**Longer –lasting, less intense**) exercise (**Aerobic Exercise**) utilizes **oxygen & depends on aerobic respiration.**

✌ Biochemistry lecture has more details about this point

## Fast sources of energy in high-intensity short-term bursts of activity:

(The quick energy sources)

- (1) Phosphocreatine system (The most rapid source, but the most readily depleted)
- (2) Glycolysis, &
- (3) Adenylate Kinase

## Glucose Availability

- Plasma glucose is maintained by an equal rate of glucose appearance (entry into the blood) and glucose disposal (removal from the blood).
- In the healthy individual, rate of appearance and disposal are essentially **equal** during exercise of moderate intensity and duration.
- However, prolonged, intense exercise can result in **a fall in blood glucose level and the onset of fatigue**.
- During exercise, rate of glucose appearance depends mainly on the liver (**glycogenolysis & gluconeogenesis**), and to a lesser extent, on absorption from the gut.

## Oxygen Availability

Depends upon →

- (1) **Cardiac output** (the quantity of blood distributed by the heart)
- (2) The ability of the lung to **oxygenate the blood**
- (3) **arterio-venous (a-v) oxygen difference** (i.e., the ability of the exercising muscle to take up oxygen from blood).

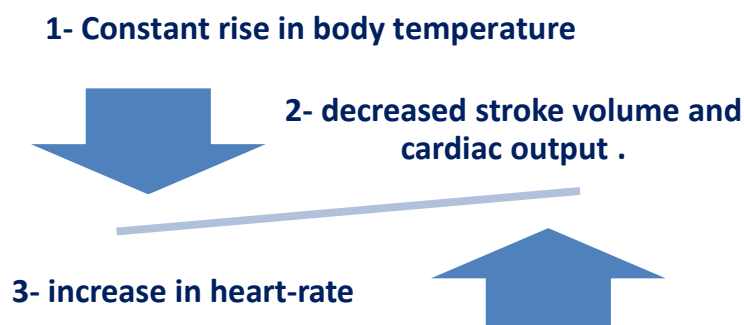
## Degree of Hydration

Intense prolonged exercise produces metabolic waste **heat**. The heat is removed by sweating which, if intense, may cause **dehydration**.

\* A male marathon runner loses each hour around **0.8 L** in cool weather and **1.2 L** in warm weather. A female marathon runner loses about **70%** of what the male loses.

\* However, in hot weather, heavy exercise can cause much **more losses** of fluid from the body → **dehydration**.

- **Dehydration leads to:**



## Blood Catecholamines & Ammonia

Plasma catecholamine concentrations can **increase by 10 times**. Ammonia, which is produced by the exercising muscles from ADP, is released into the bloodstream, leading to **increased circulating levels**.

## Other Factors that affect performance

|                       |  |
|-----------------------|--|
| <p><b>Age</b></p>     | <p><b>Youth are better in sport performance</b> than elderly e.g., a footballer getting old may retire or be a coach.</p>  |
| <p><b>Gender</b></p>  | <ul style="list-style-type: none"> <li>Because of difference between genders of in body build and physical ability, <b>men can perform better than women in contact sports</b> such as boxing, rugby and wrestling.</li> <li>Menstruation : women may perform differently at different times during their monthly menstrual cycle</li> </ul>   |
| <p><b>Drugs</b></p>   | <p><b>(1) Anabolic steroids ( e.g., Testosterone ):</b> الهرمونات البنائية<br/>These are used by some athletes (both sexes) to <b>increase their muscle mass</b>, allow the athlete to train harder and thereby enhance their physical performance. They have harmful <b>side-effects</b> such as raised blood pressure and increased facial hair in female athletes. Their use in sport competitions is <b>illegal</b> .</p> <p><b>(2) Stimulants:</b> المنشطات<br/><b>Stimulants increase reaction speed</b> (i.e., decrease reaction-time), reduce perception of pain and raise aggression. They are highly addictive and have side-effects including high blood pressure, cardiac problems, strokes, and liver disease.</p> <p><b>(3) Narcotic analgesics</b> مخدرات الالم<br/>These are <b>pain killers</b> which athletes use to mask pain from an injury or overtraining. They are also highly addictive and cause withdrawal symptoms when the athlete stops using them.</p> |
| <p><b>Sleep</b></p>   | <p><b>Sufficient, restful sleep is important</b> for physical and mental health.</p> <ul style="list-style-type: none"> <li>❖ Lack of sleep makes the athlete nervous and irritable, &amp; deteriorates the physical performance.</li> </ul>   |
| <p><b>Disease</b></p> | <p><b>Musculoskeletal disease</b> e.g., sprain &amp; disk, or <b>General disease</b> e.g., bronchial asthma , colds &amp; flu (All may affect muscular exercise performance)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>*A sprain is an injury to a ligament by stretching or a tearing</b><br/> <b>*A strain is an injury to either a muscle or a tendon</b></p> </div>   |

|                              |   |
|------------------------------|---|
| <b>Personality type</b>      | <p>1. <b>Introverts:</b> يفضلون الالعاب الفردية<br/>Tend to like sports which:</p> <ul style="list-style-type: none"> <li>✓ require precision , self-motivation ,</li> <li>✓ need low arousal levels &amp; individual</li> <li>✓ performances e.g., archery رمى السهام , golf and snooker</li> </ul> <p>2. <b>Extroverts:</b> يفضلون الالعاب الجماعية<br/>prefer sports which are: exciting, team sports, &amp; need high arousal level , need large, simple motor skills e.g. rugby and boxing</p> |
| <b>psychological factors</b> | <p>(i) <b>Aggression</b> can sometimes be useful and sometimes harmful</p> <p>(ii) <b>Depression and lack of motivation are harmful</b></p>   |

## Overtraining Syndrome

- With increasing competitiveness in sport throughout the world, overtraining has become common among athletes.
- Overtraining occurs when the athlete, while **stale** مجهد ( with impaired **vigor** نشاط and **effectiveness** ) is pushed/forced ( e.g. by a coach ) to continue training at **high intensity**
- This frequently results in development of “**Overtraining Syndrome**”.

حالة تنتج عند اجبار الرياضي على زيادة التدريب بالرغم من اجهاده واعياؤه، وهذه الحالة تكثر في مختلف المنافسات الرياضية حول العالم.

- Overtraining syndrome is a **chronic, debilitating** موهن (body-weakening) condition.
- It may impair an athlete during training or daily work, with **signs** of -:
  - (1) Decreased concentration انخفاض مستوى التركيز
  - (2) Irritability and increased anger الهيجان والغضب
  - (3) Slowed mental function انخفاض مستوى الوظائف العقلية
  - (4) Diminished self-esteem انخفاض الحافز الذاتي

### Symptoms:

Feeling of tiredness - inability to exceed former - levels of performance- decreased ability to perform & recover.

### Stages of overtraining:



- These conditions are not limited to mature adult athletes.
- Young athletes are continuously confronted with increasing expectations, often resulting in unrealistic demands on time and physical performance
- This may lead to early withdrawal from the sport environment.

Good Luck