ITF Coaches Education Programme Level 2 Coaching Course

Energy systems in tennis

How human energy is produced?

ADENOSINE TRI-PHOSPHATE (ATP)

↓

BREAKDOWN

↓

ENERGY REQUIRED FOR MUSCULAR CONTRACTION DURING 2-3 secs.

↓

3 ENERGY SYSTEMS TO REPLACE ATP

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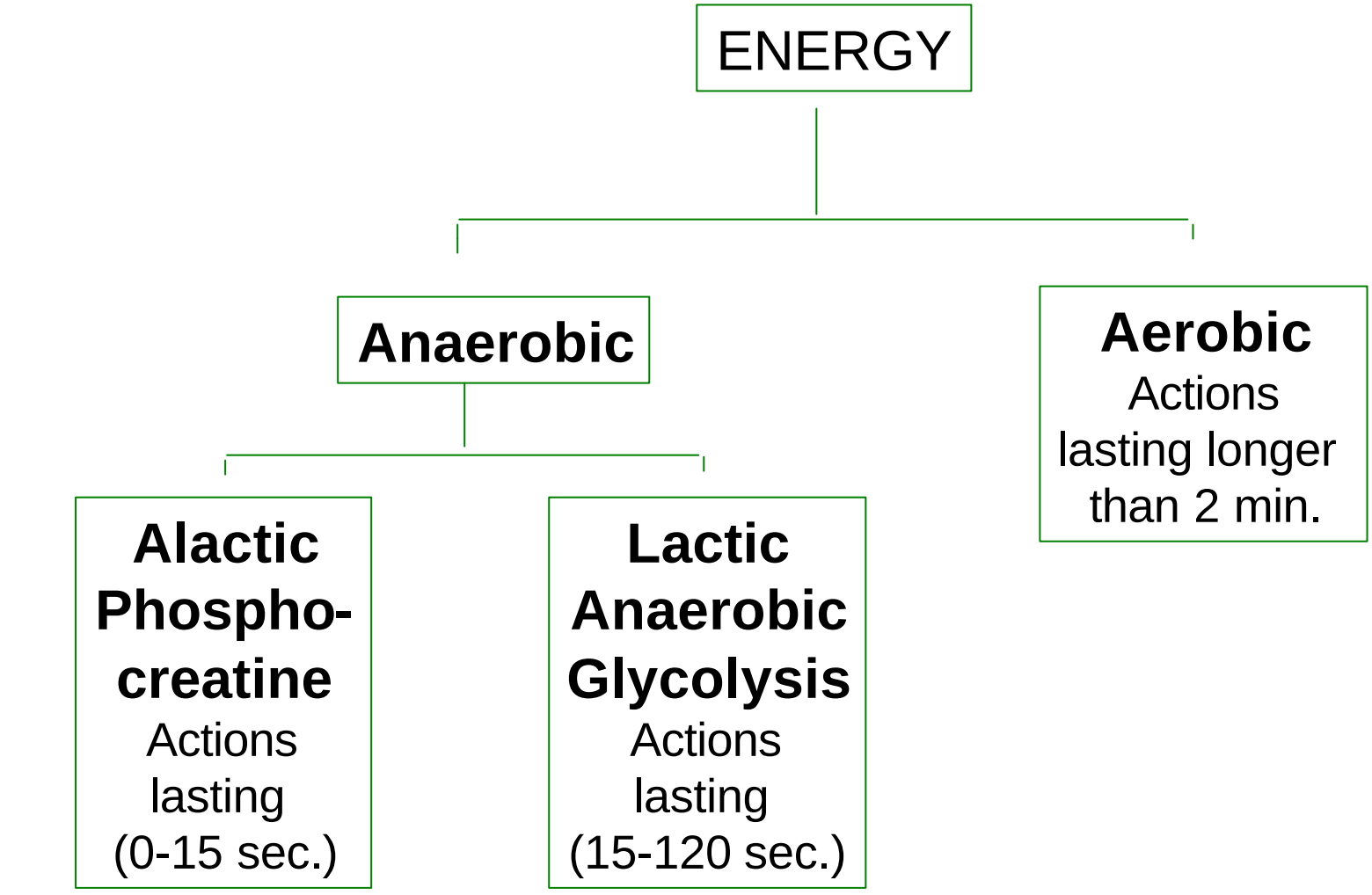
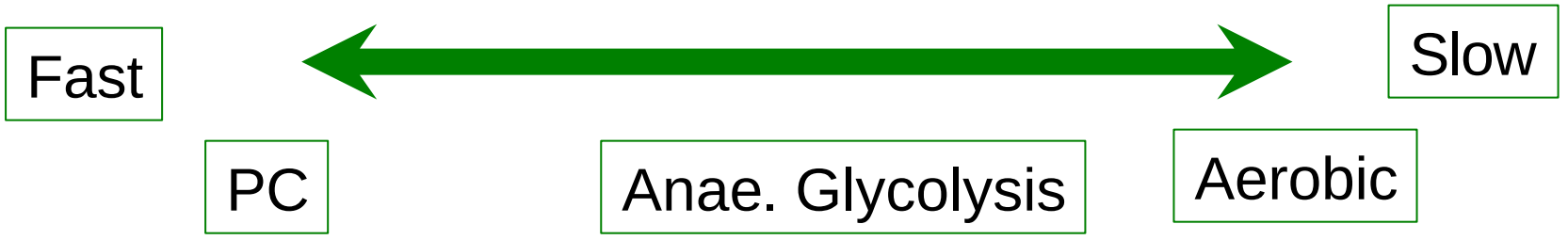
Energy systems

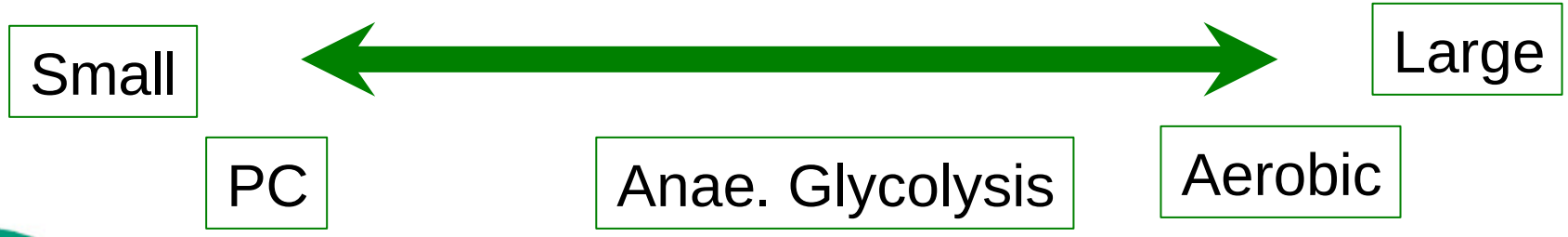


Comparison between energy systems

SPEED OF RELEASE



AMOUNT OF ENERGY AVAILABLE



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Phospho-creatine (PC)

- Provides an immediate form of energy
- Only supplies ATP for up to approximately 15 sec.
- It is anaerobic
- Examples:
  - Sprinting to a short ball
  - Serving and volleying
  - Playing a point for up to 15 sec.

Anaerobic glycolysis

- Not dynamic as the PC system
- Can provide energy for up to 2 minutes
- It produces as a bi-product a substance called LACTIC ACID:
  - This substance has been shown to be associated with fatigue

Lactic acid

- It is always being produced, when we don't see it in the blood it is because production is less than removal
- If lactate production is:
  - equal to removal rate no change is seen
  - more than removal rate then there is an increase in blood lactate
  - less than removal rate then no change (increase) is seen

Lactic acid values

- ‘Flat out’ cycling for 30 secs: 19 mmol l.
- Football player: 6-9 mmol l.
- Tennis training match: 1-9 mmol l.
- Tennis tournament match: 2-8 mmol l.

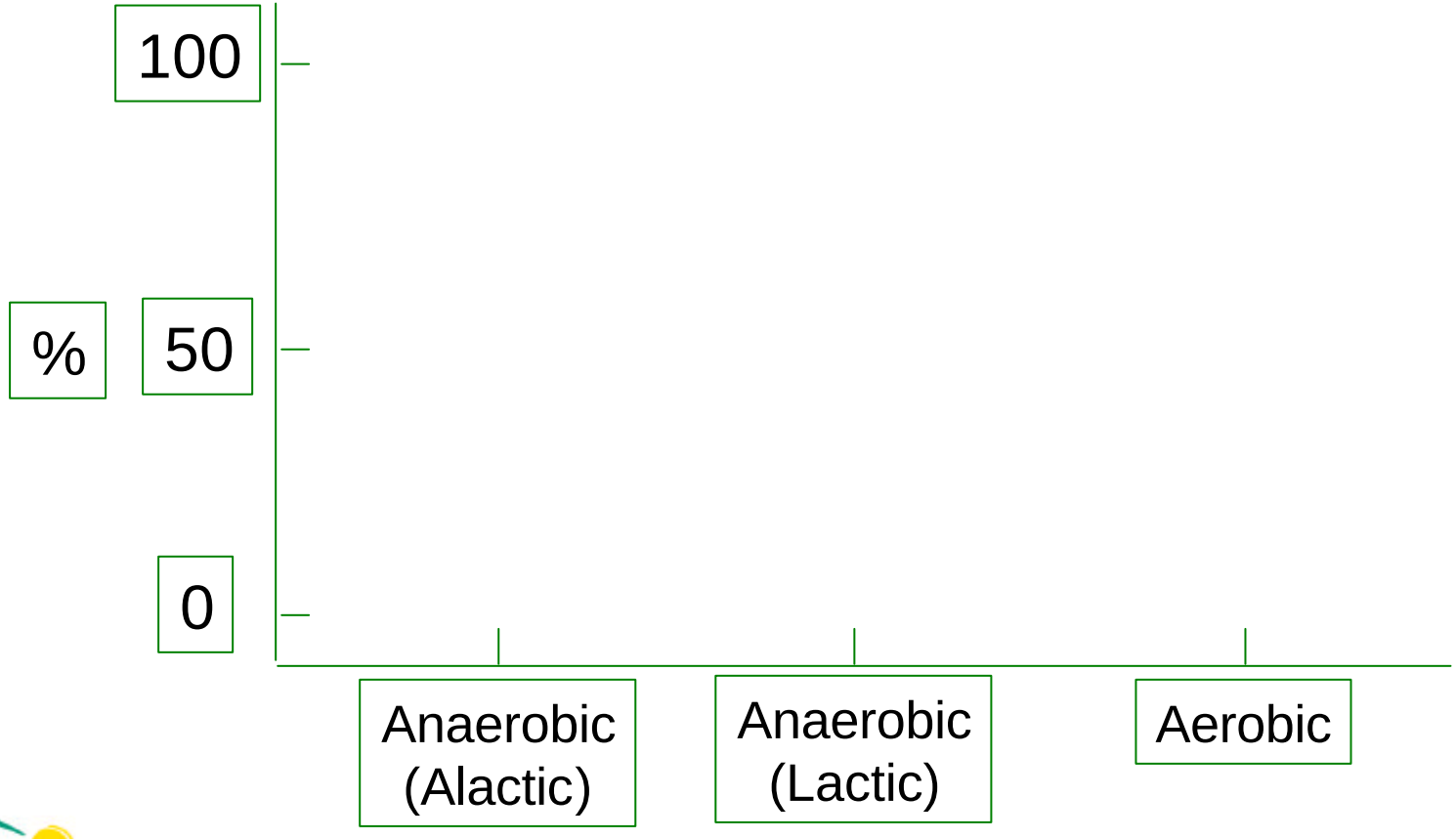
Aerobic system

- Requires oxygen to function
- Cannot supply ATP to the working muscles as fast as the other two
- But it can sustain a steady demand for energy over a long period of time

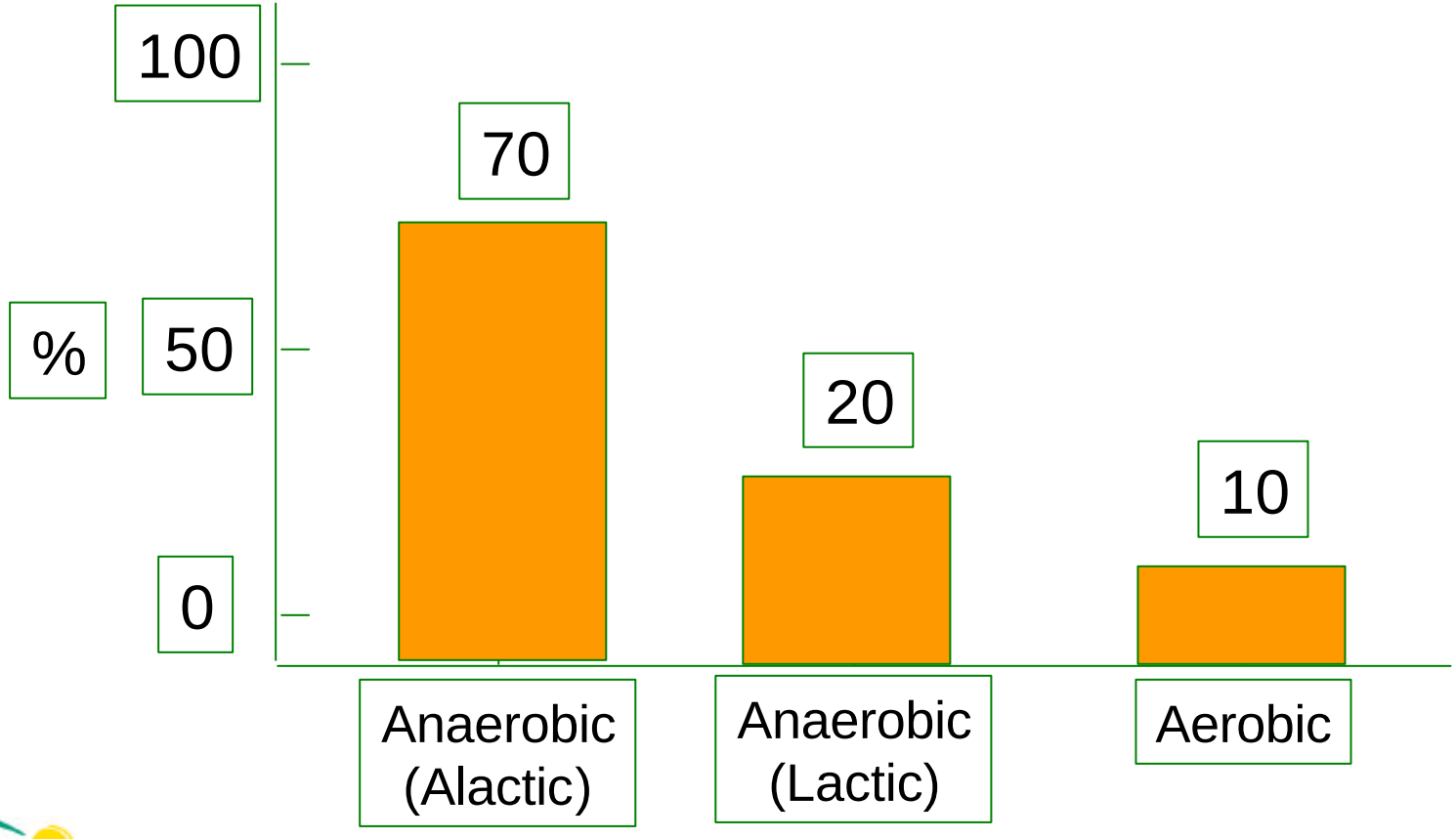
ATP Replenishment

- 50-80% replenishment after 30 sec.
- 100% replenishment after 3 min.

Energy systems in tennis



Energy systems in tennis



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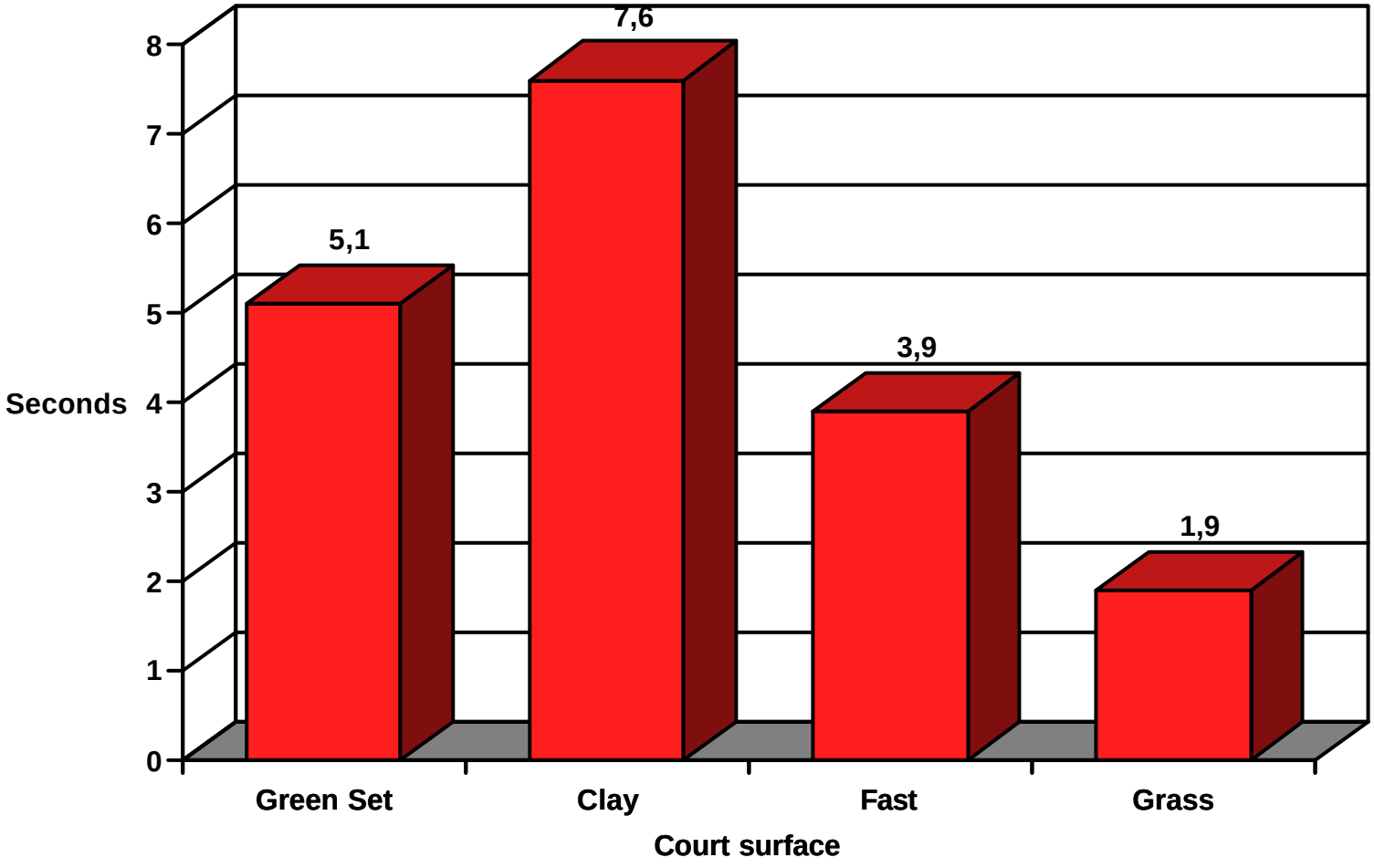
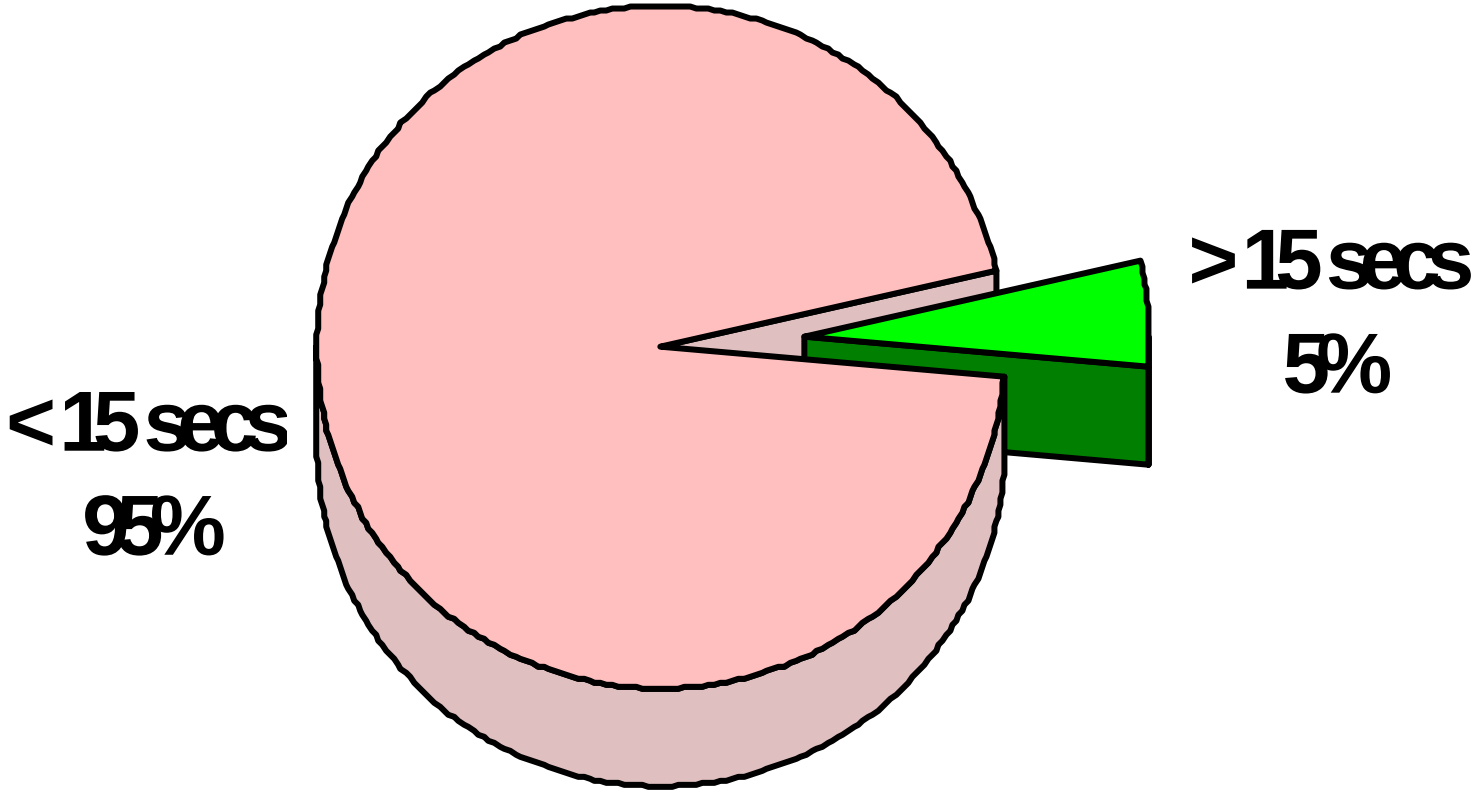
Physical demands of tennis

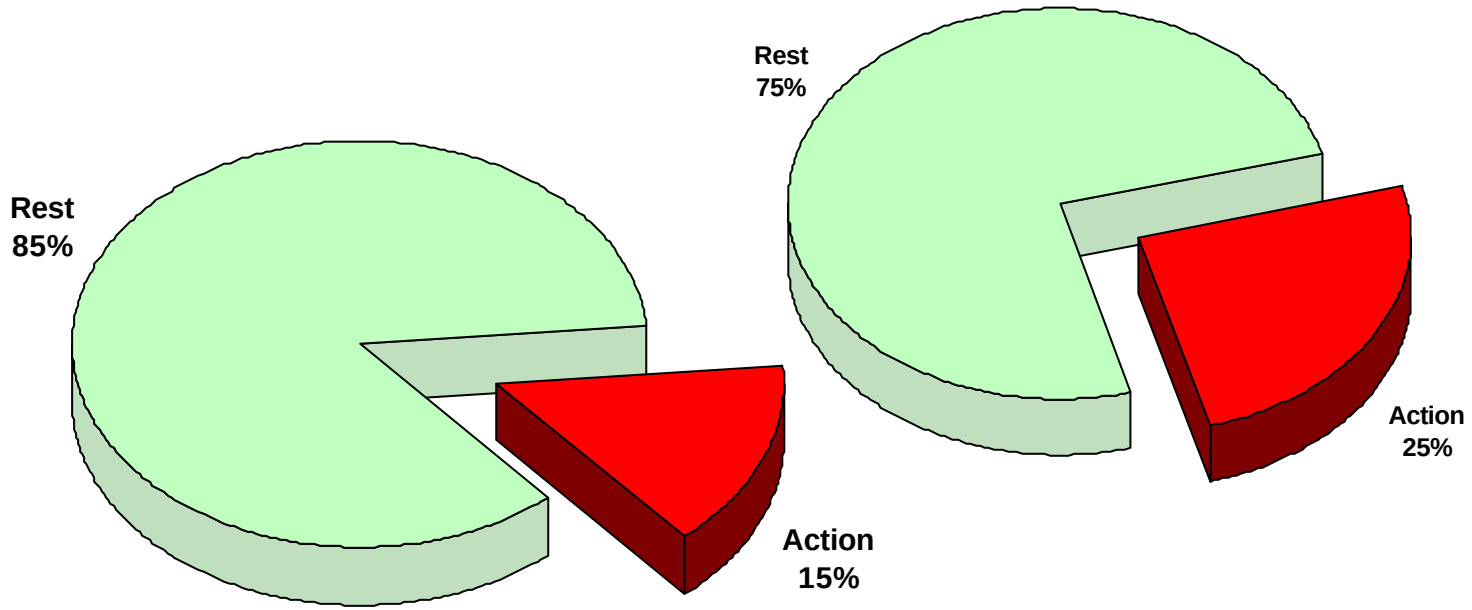
Strokes per point



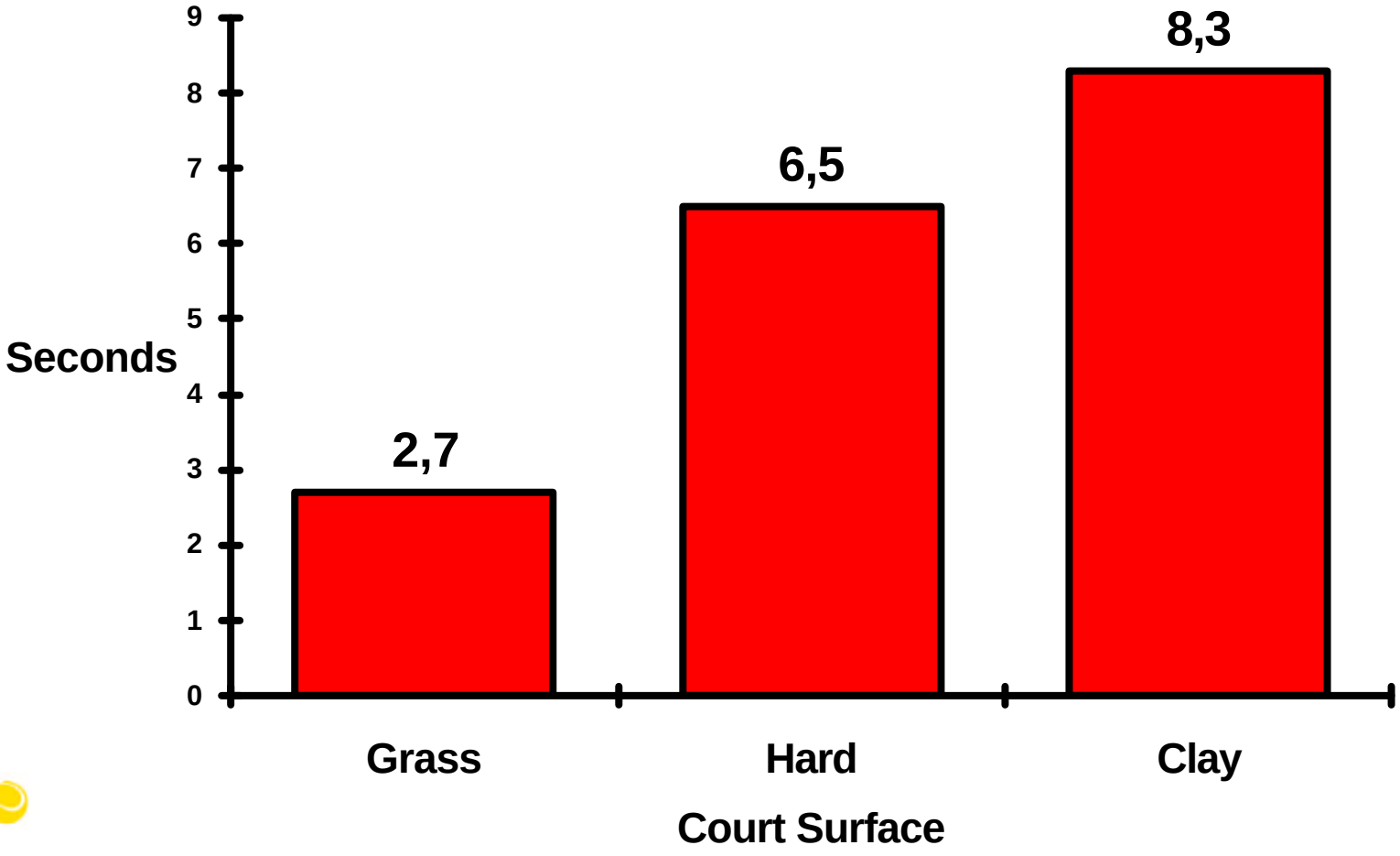
Time points are played



Percentage of action/rest per match



Average time of points men's pro tennis today



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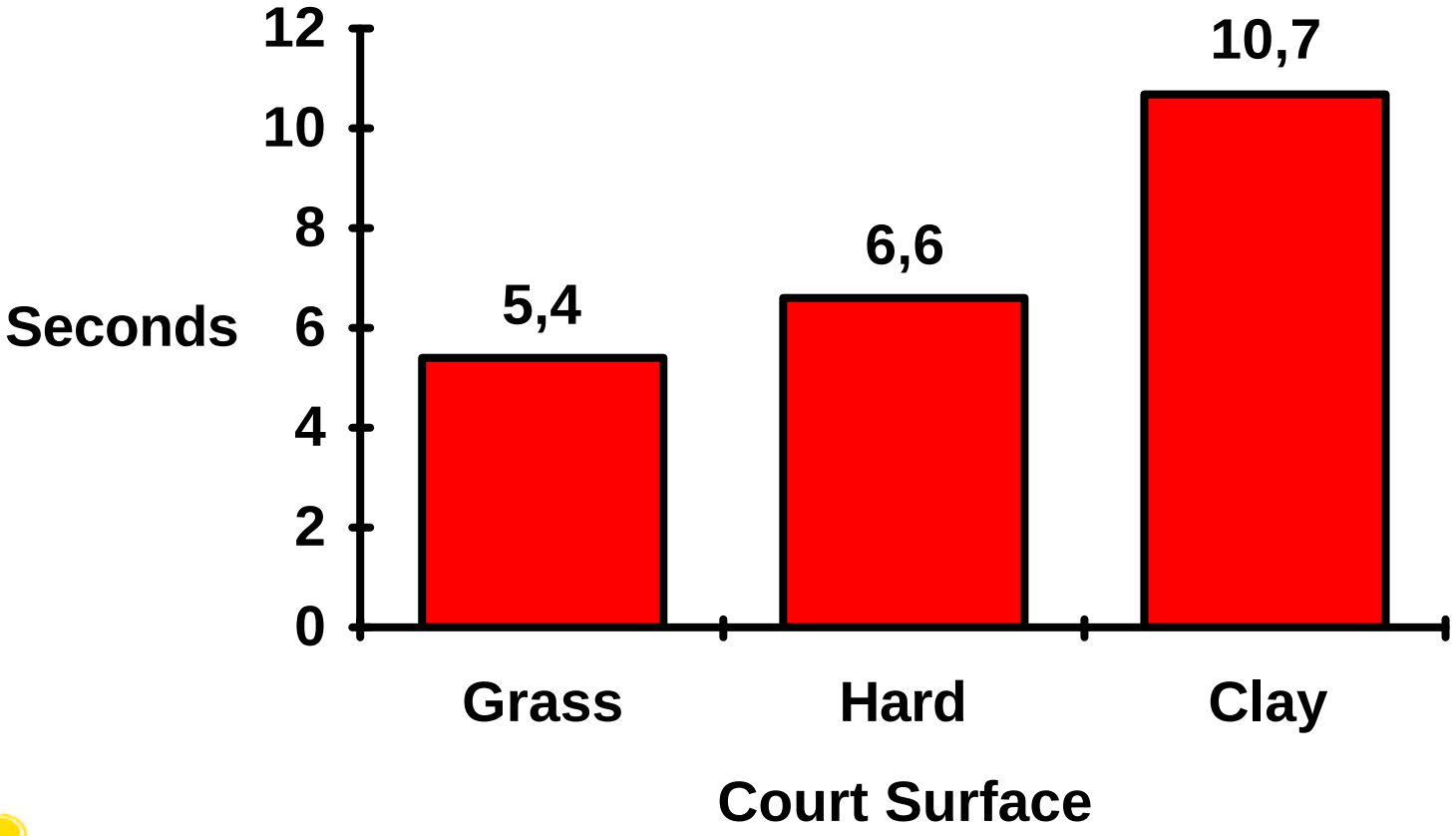
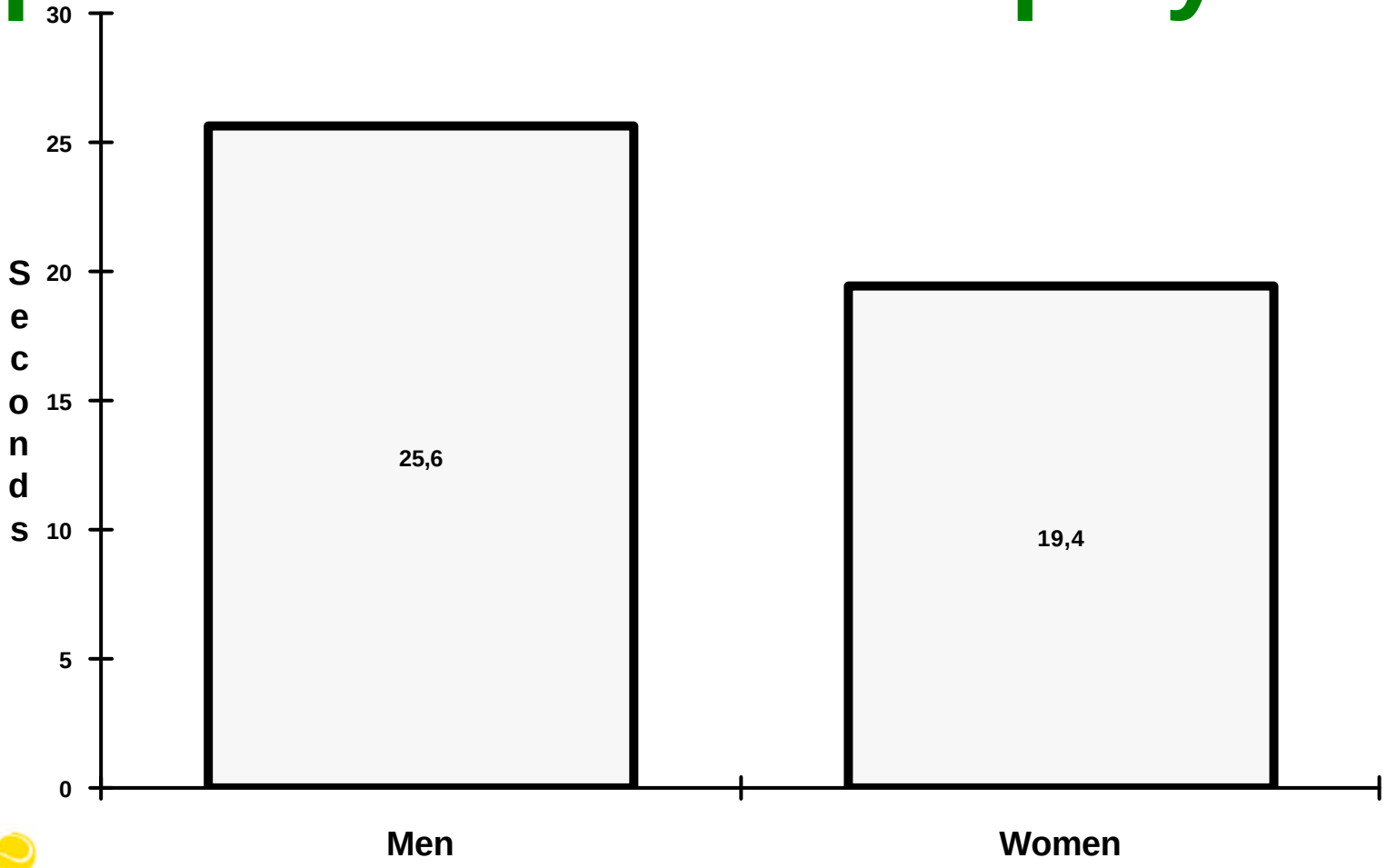
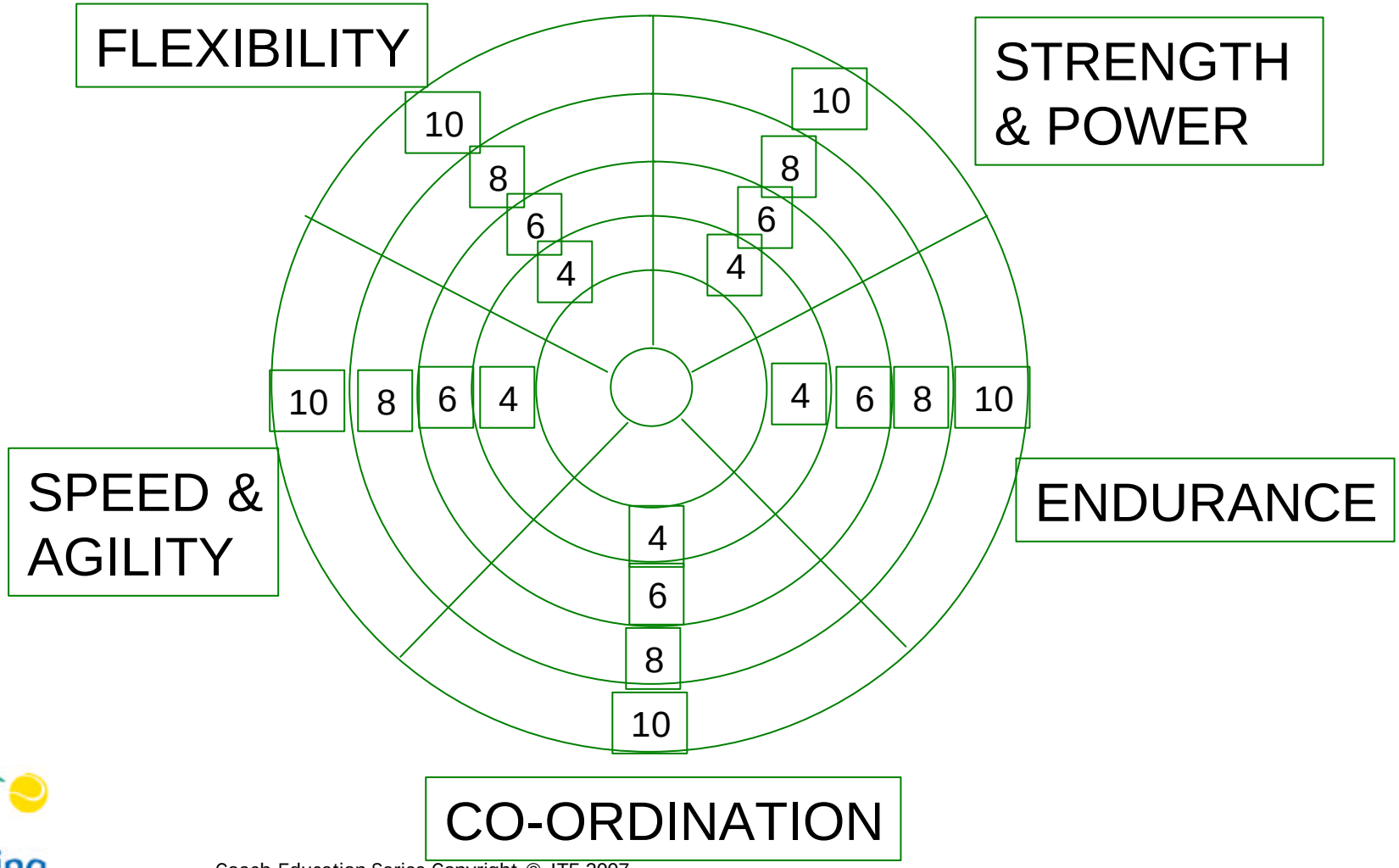
Average time of points women's pro tennis today



Time between points professional tennis players



Physical demands of tennis



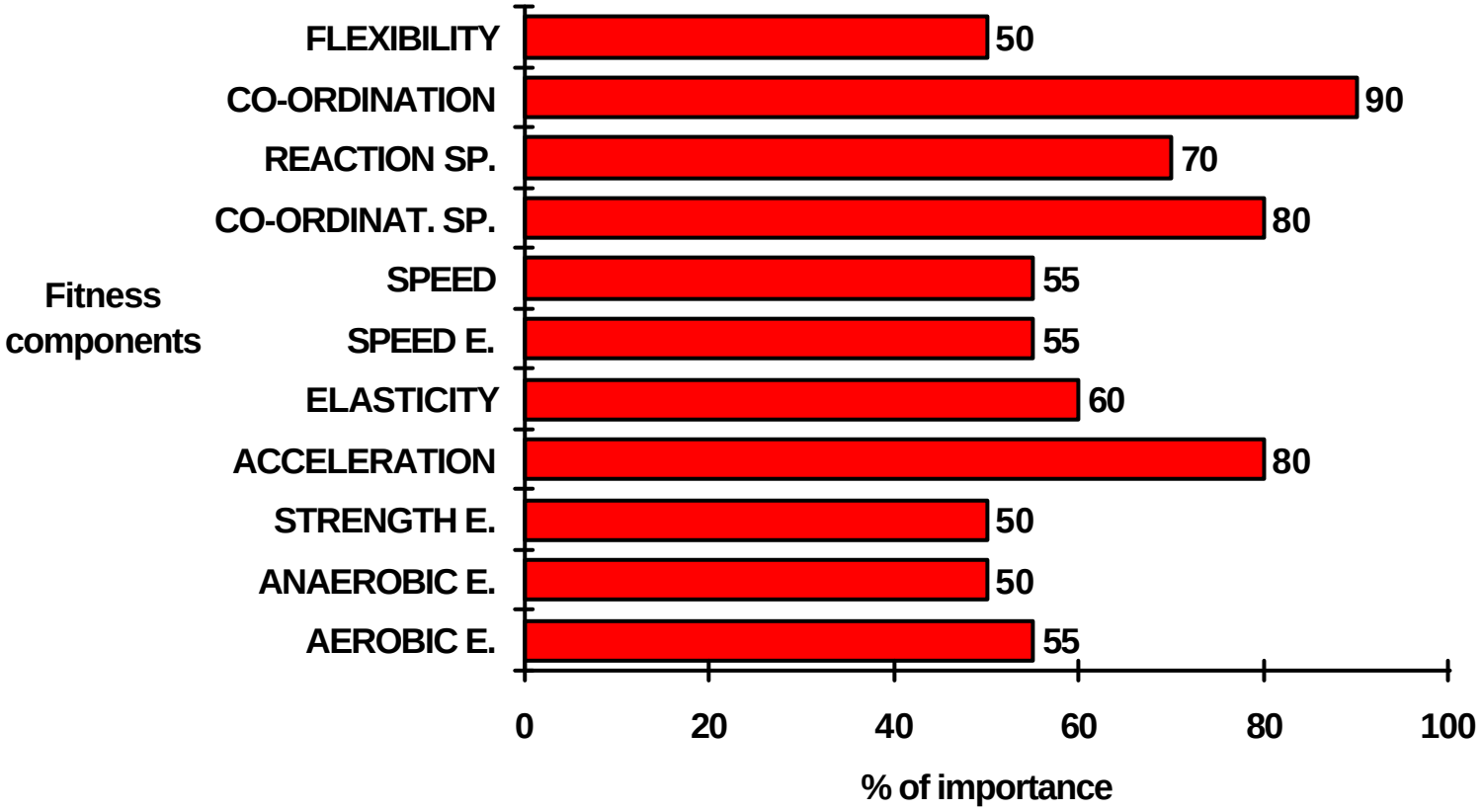
Physical demands of tennis (I)

Data	Condition	Training system
Work:rest ratio 1:2 or 1:3 Intensity: submaximal Lactate levels: Less than 4 mmol	Mixed endurance activity anaerobic alactic (70%), anaerobic lactic (20%) and aerobic (10%)	Interval training
1 change of direction every 1.1 sec. on average within 5.2 secs of play An average of 38 to 80 changes of direction occur in each set	Agility, balance	Agility drills on court Specific tennis footwork Dynamic balance
Ball flight time of 1.4 secs. between two points of contact Baseline shot speeds of approx, 57-86 km/hour The human eye can't see the ball when it is 1.5 metres to impact Ball contact lasts 0.04 secs.	Co-ordination	Hand-eye co-ordination drills Speed of co-ordination

Physical demands of tennis (II)

Data	Condition	Training system
Each impact of the ball and the racket produces a load to the wrist and arm of 25 to 31 kgs Abdominal and lower back muscles contract on average at 70-80% of their maximum intensity when hitting the ball	Strength and power	Reaction power Upper and lower body strength
Court sprints may cover a maximum of 14 metres with a majority of sprints being between 2.5-6 metres Total distance run during one point is 14 metres	Speed	Power speed Reaction speed Short distance drills
Continuous bending, stretching and twisting of the body to reach and hit the ball	Flexibility	Flexibility routine before and after each workout and match

Physical demands of tennis



Schonborn, 1987