

Court Speeding

Developments in Surface Pace measurement

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Introduction

Presentation outline:

- What is surface pace and how it is measured?
 - Wassing Sestée and visual analogue scales
- Improving the measure
 - Correlations between the science and the perceptions
- Development of the ITF 'SPRite'
 - Going portable with testing
- Changes to the rules of tennis
 - Davis Cup hits the brakes

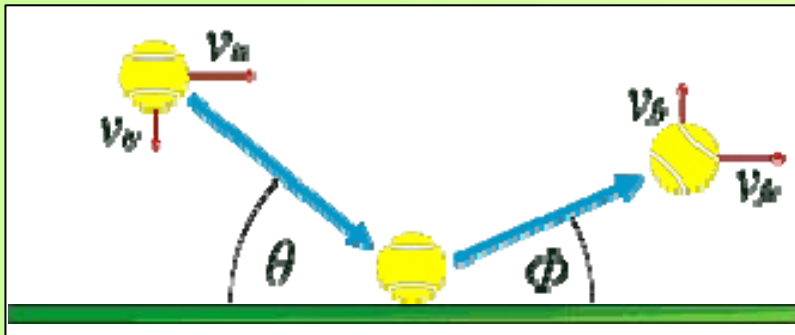


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Surface pace

What is it?

- A measure of how fast or slow a tennis court surface is
- Brody (1984) published the following equation:

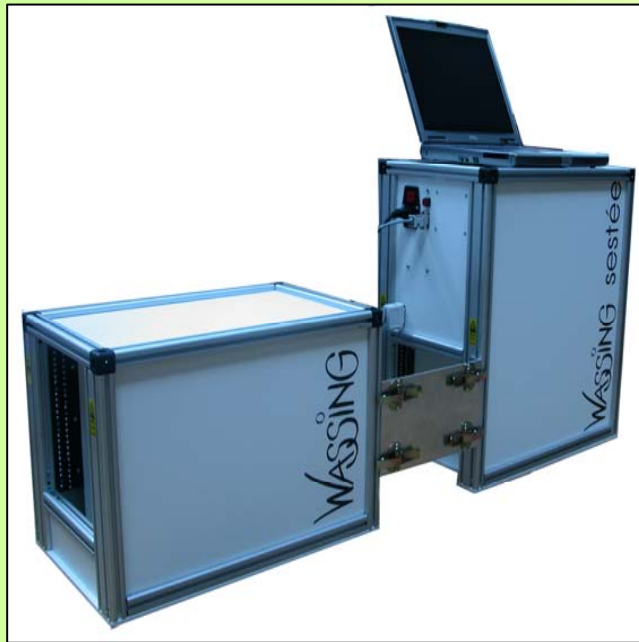


$$\mu = \frac{v_{ix} - v_{fx}}{v_{iy} + v_{fy}}$$

$$SPR = 100(1 - \mu)$$

Surface pace

How to measure surface pace...



Wassing Sestée



Tennis ball cannon

Surface pace

SPR assumes that players associate the pace of the court with the ball/surface friction

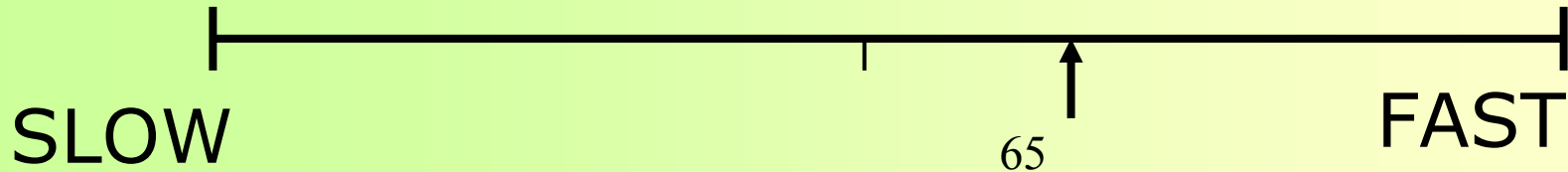
- Is this the case...?
- 2003 & 2004 player perception study
- Variety of court types utilised
 - SPR measured with the Sestée
 - Player perception measured with a Visual Analogue Scale (VAS)



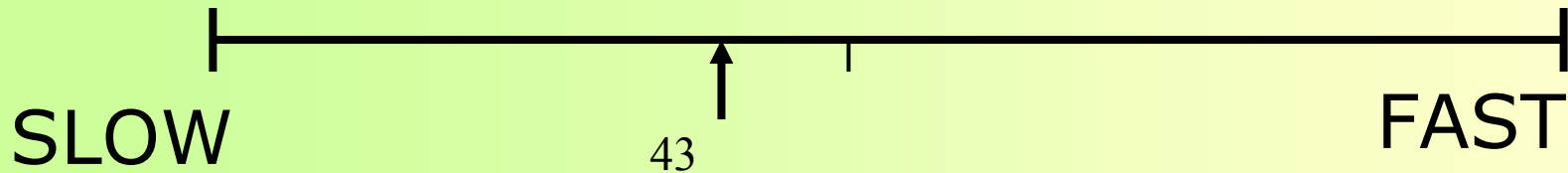
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Visual Analogue Scales

Court surface: artificial grass

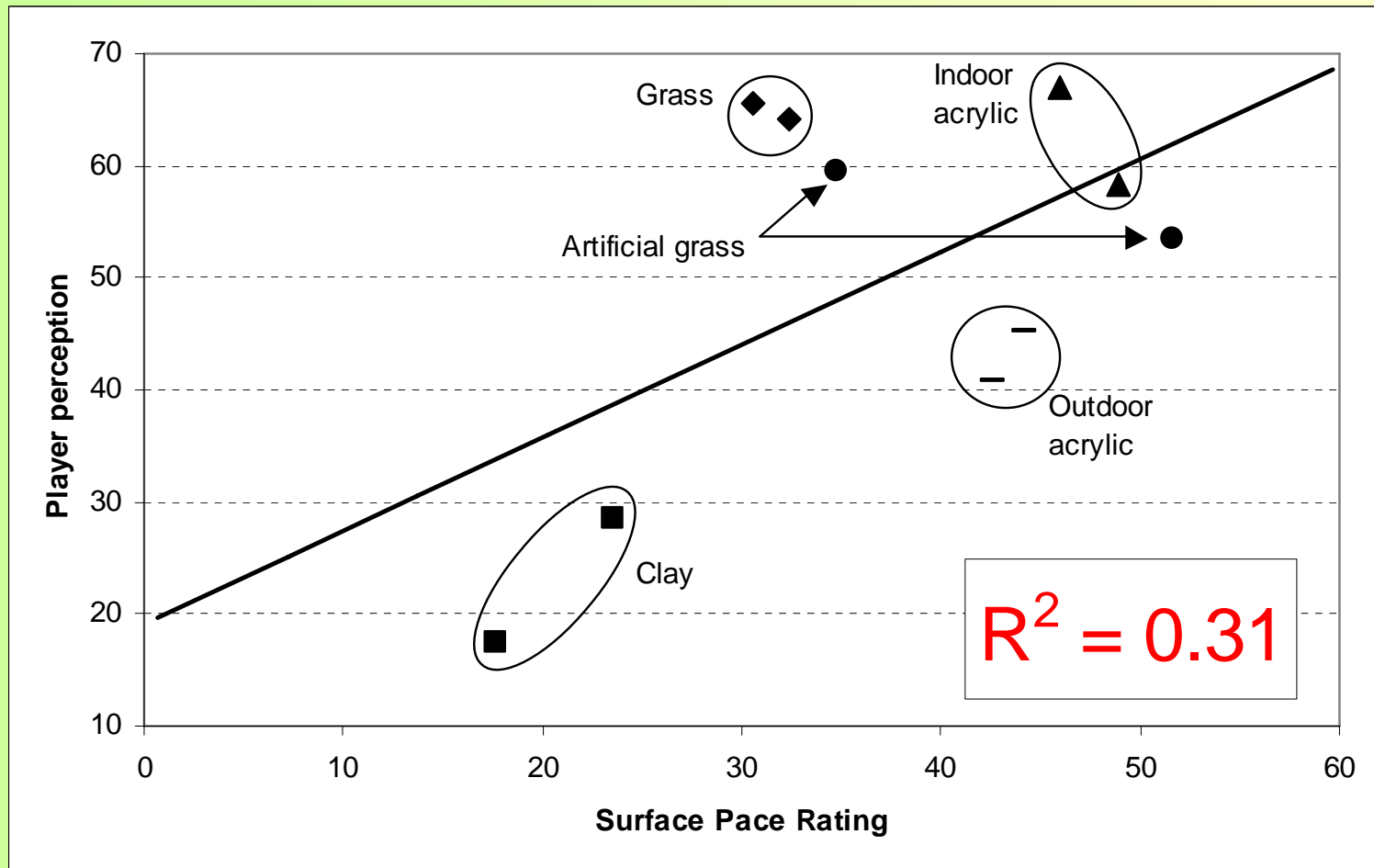


Court surface: green clay



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Player perception vs. Surface Pace Rating: the problem...

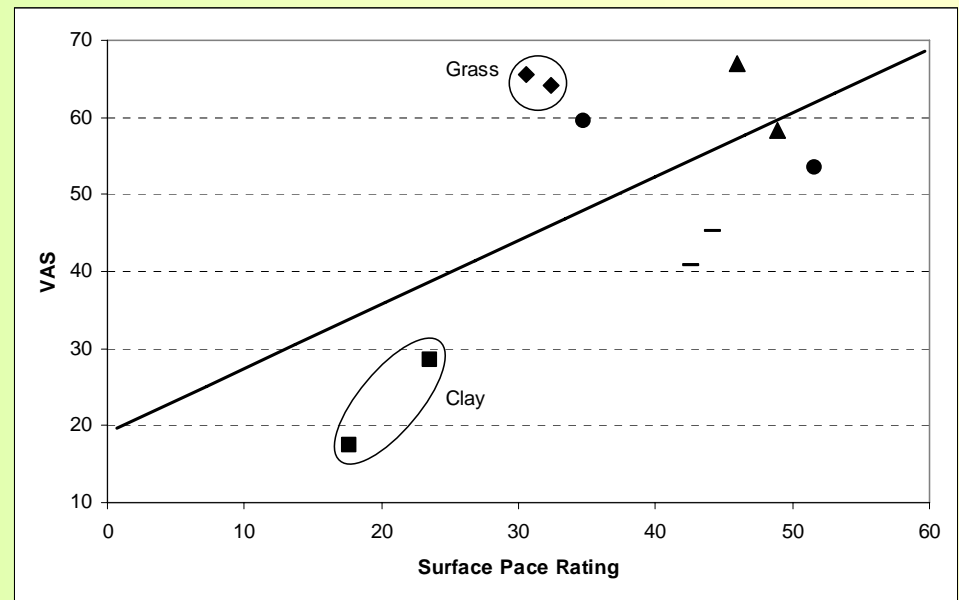


Improving the correlation

Least correlated surfaces appear to clay and grass

- Clay perceived slower & grass perceived faster

- COR affects time between successive bounces
 - Time available for player
- Ramping affect of clay 'kicks' ball up
- Low stiffness of grass absorbs vertical energy



- Investigate COR and incorporate into definition of SPR

Improving the correlation

$$\text{Revised SPR} = \text{SPR} + a(b - \text{COR}) \quad a = 150, b = 0.81$$

Examples:

	COR	SPR	Revised SPR
2003 Outdoor grass	0.76	30.5	38.4

SPR increased

	COR	SPR	Revised SPR
2003 Outdoor clay	0.90	17.6	4.6

SPR decreased

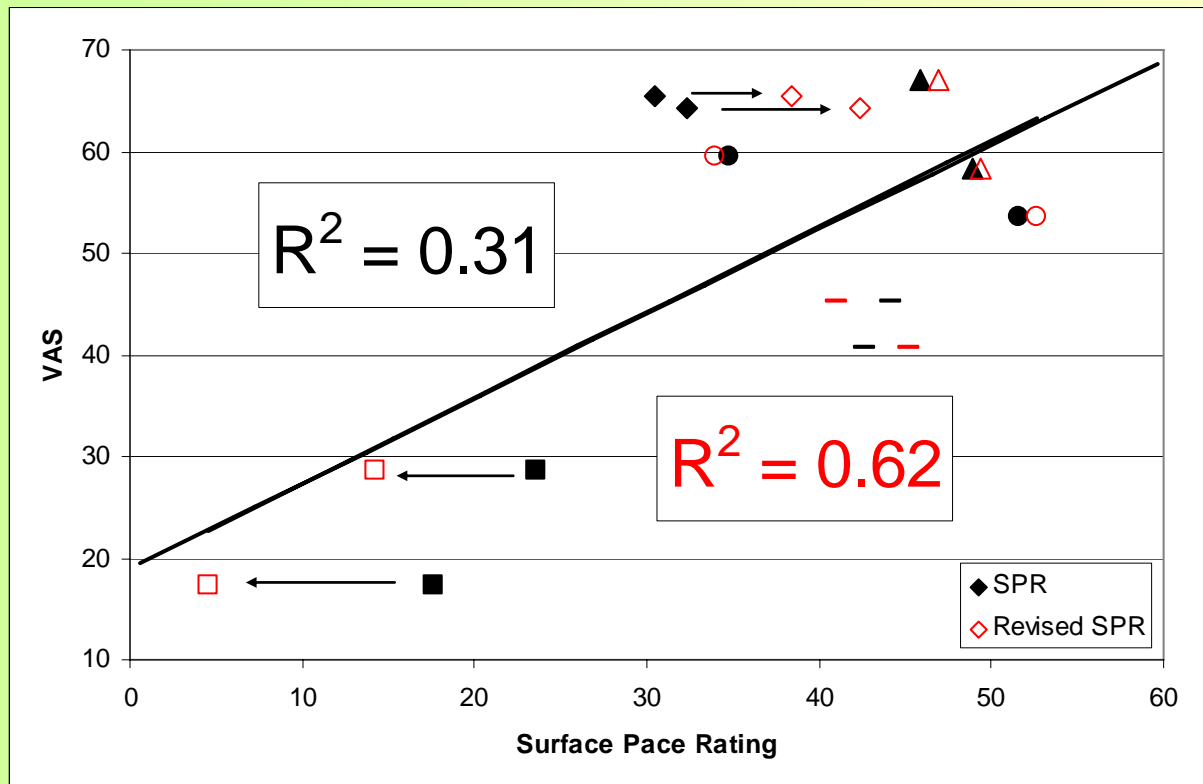
	COR	SPR	Revised SPR
2004 Indoor acrylic	0.81	48.9	49.4

SPR unchanged



Improving the correlation

Revised SPR renamed 'Court Pace Rating' (CPR) with improved correlation to player perception



Project 'SPRite'

The ITF are the guardians of the game, and one of their roles is to protect the nature of the game.

- To fulfil part of this role, they need to monitor the SPR for tennis surfaces all over the world.
- This is difficult to achieve using only the Sestée as this device is:
 - relatively expensive
 - requires a skilled operator to use
 - difficult to transport.
- Project SPRite
 - develop a low cost, portable system that can be shipped to various locations around the world.



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Project 'SPRite'

Design brief:

- measure CPR to within 5 points of that measured by the Sestée
- require no external power source
- be intuitive to operate so that it can be used with minimal training
- have no user dependency
- be portable

SPRite development:



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Project 'SPRite'

A practical demonstration...



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Surface Pace and the Davis Cup

The Davis Cup:

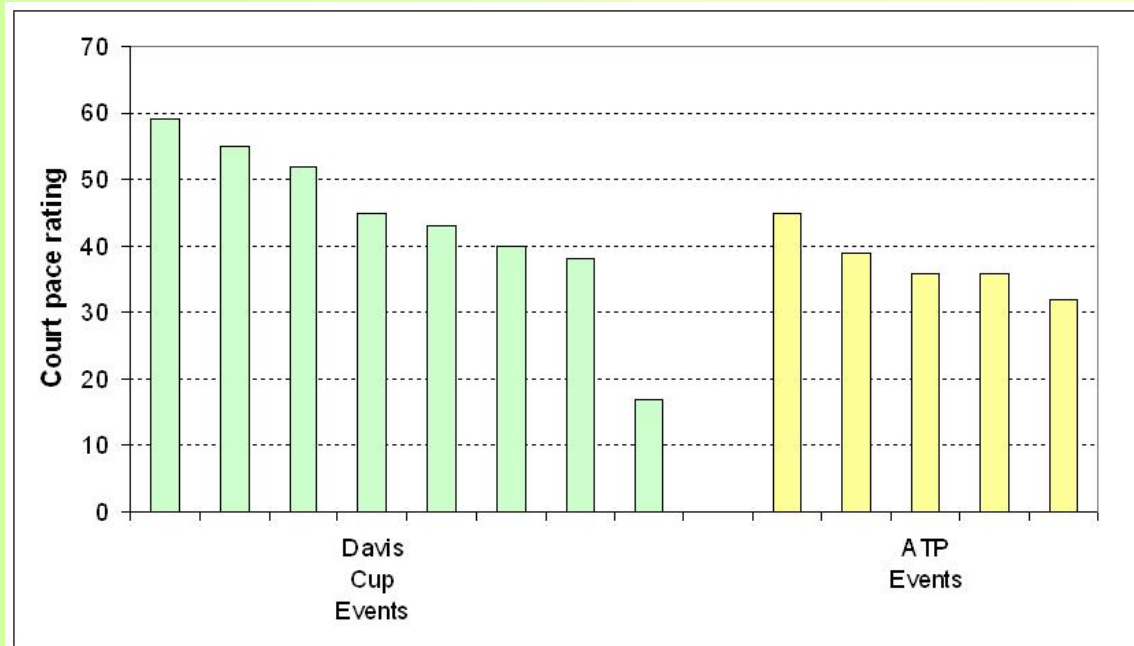
- While 127 nations have entered the Davis Cup for 2008, only 16 countries qualify for the elite World Group each year
- Each tie is held at the chosen home teams court of choice, given a unique flavour to the event
- In 2008, a new rule was introduced to limit the home advantage...
- ...based on findings of a 8 year study into the surface pace of Davis Cup ties



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Surface Pace and the Davis Cup

CPR measurements for a selection of Davis Cup ties and ATP events:



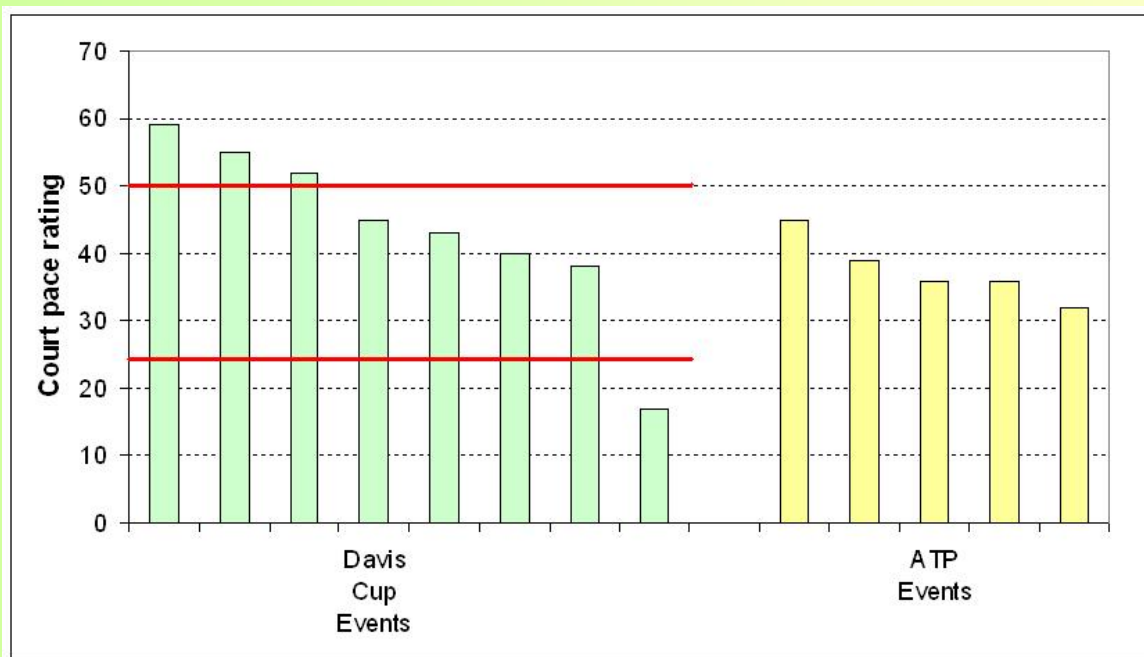
Is the home team advantage too great?



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Surface Pace and the Davis Cup

CPR for Davis Cup must be no slower than 24 CPR and no faster than 50 CPR*



*natural surfaces exempt



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Conclusions

- CPR
 - providing an improved correlation between measured pace and player perception
- The SPRite
 - bringing surface measurements to the masses
- Davis Cup
 - Court speeding but let off with a warning...



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Court Speeding

Developments in Surface Pace measurement

The End



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