ITF Coaches Education Programme

Biomechanics of the one- and two-handed backhands

Original article: Reid, M.M. (2001). *ITF CSSR*, 24, 8-10
Introduction

The backhand and the modern game

• Nucleus of tennis stroke production along with the forehand and the serve
• A consistent topspin backhand is necessary to complement the forehand and the serve
• Modern game:
  – Backhands as penetrative and powerful as any other stroke
  – The two handed backhand represents the primary weapon of some of the world’s foremost players
The backhand

*Selection of the type of shot*

- Significant implications on the player’s development
- Until recently no information on mechanical characteristics of modern one-handed and two-handed stroke
- Earlier descriptions did not clarify the supposed mechanical advantages and disadvantages of each backhand stroke
The backhand

*The debate: which one (or two) to choose*

- Proposed benefits of each with respect to:
  - Velocity generation
  - Topspin
  - Reach
  - Skill acquisition
  - Disguise

- Open stance to the backhand stroke
- Mechanical variation within the two-handed
The backhand

*Velocity generation*

- One handed backhand is a multi-segmental (5) stroke
- Two handed stroke:
  - Earlier work suggested that involved a bi-segmental co-ordination (hip rotation followed by trunk-limb-racquet segment rotation)
  - Joint rotation at the hips, shoulders, elbows and wrists shows that it is also multi-segmental
The backhand

Which produces higher racket velocities at impact?

• One handed:
  – Long radius of rotation
  – Swinging movement has greatest arc
  – In the past was believed to produce more velocity
The backhand

Which produces higher racket velocities at impact?

• Two handed:
  – Shorter hitting radius
  – Greater angular velocities of the racket at impact
  – Comparable linear velocities at the impact position
  – Using more elbows and wrists reduce the hitting radius (i.e. Williams)
The backhand

Production of topspin

• Factors determining type and amount of spin:
  – Trajectory (upward and steeper)
  – Alignment of the racquet at impact
The backhand

Production of topspin

• One hand:
  – Difficult for beginners since they need additional strength
  – To attain high vertical velocity for a topspin shot, players need to decrease the horizontal acceleration of the racquet up to impact
The backhand

*Production of topspin*

• Two handed:
  – More simple due to the additional strength of the second hand
  – Players can build horizontal and vertical velocity right up to the impact position for a topspin shot
The backhand

*Reach*

- Two handed:
  - Need to release the top hand to play balls when approaching full stretch
The backhand

*Reach*

- Impact distance from the body:
  - Same lateral distance for both types
  - Frontal: One handed is further forward (20-30cm) due to longer radius of rotation
  - Two handed: over or just in front of the outside foot
The backhand

Skill acquisition

• One handed:
  – Requires additional strength
  – Segments move one after the other
The backhand

Skill acquisition

• Two handed:
  – Less body segments used independently (ie. different segments move together)
  – Preparation for impact easier
  – Facilitate playing balls of varying height
• Other factors to consider:
  – Development of the backhand slice
  – Backhand volley
The backhand

Disguise: Two handed backhand

- Shorter forward swing
- More rapid horizontal and vertical acceleration to the ball
- Less time to detect any kinematic variance
- Use of the top hand (i.e. nearest the throat) for the purposes of disguise when players have less time to balance and set-up
The backhand

Open stance

• Reasons:
  – Increasing dynamicity of the modern game
  – Time pressure

• Tactical and recovery advantages:
  – Alleviates the time pressure
  – Allows players to recover more efficiently
The backhand

*Open stance: Two handed*

- Additional strength facilitates:
  - Pivoting about the outside leg,
  - Rotating the shoulders well past the hips
  - Applying an aggressive pre-stretch to the abdominal musculature and the lat-gluteal complex
  - Using the shot almost exclusively when under time pressure at the back (as in forehand)
The backhand

Open stance: One handed

- When using an abbreviated backswing:
  - From a relatively stationary set up (i.e. the return)
  - To play higher bouncing balls off the back foot
- Semi-closed stance is preferred:
  - Provides a longer path over which to generate racket velocity
  - More favourable (in terms of stability and strength) impact position
The backhand

**Variation in the two handed technique**

- In the interaction of segments
- In the angular displacement of the two upper-limbs (i.e. elbow and wrist joint motion),
- Provides a distinction in:
  - The racket’s trajectory
  - Positioning up to and for impact
- Examples:
  - Venus or Serena Williams
  - Andre Agassi or Lleyton Hewitt
The backhand

Conclusion

• Recent research and the modern game point to the two-handed backhand holding certain advantages over the one-handed
The backhand

Conclusion

• Coaches should:
  – Find the most suitable backhand stroke for each individual
  – Take into account each player’s physical characteristics, coordinative ability and playing style
  – Not develop a personalised backhand preference
  – Assist the player develop his or her “own” backhand stroke.