

ORIGINAL RESEARCH

RELIABILITY AND VALIDITY OF A BIOMECHANICALLY BASED ANALYSIS METHOD FOR THE TENNIS SERVE

Natalie L. Myers, PhD, ATC, PES¹

W. Ben Kibler, MD, FACSM²

Leah Lamborn, MS, ATC¹

Belinda J. Smith, MPhty³

Tony English, PhD, PT¹

Cale Jacobs, PhD, ATC¹

Tim L. Uhl, PhD, PT, ATC, FNATA¹

ABSTRACT

Background: An observational tennis serve analysis (OTSA) tool was developed using previously established body positions from three-dimensional kinematic motion analysis studies. These positions, defined as nodes, have been associated with efficient force production and minimal joint loading. However, the tool has yet to be examined scientifically.

Purpose: The primary purpose of this investigation was to determine the inter-observer reliability for each node between two health care professionals (HCPs) that developed the OTSA, and secondarily to investigate the validity of the OTSA.

Methods: Two separate studies were performed to meet these objectives. An inter-observer reliability study preceded the validity study by examining 28 videos of players serving. Two HCPs graded each video and scored the presence or absence of obtaining each node.

Discriminant validity was determined in 33 tennis players using video taped records of three first serves. Serve mechanics were graded using the OSTA and categorized players into those with good (≥ 5) and poor (≤ 4) mechanics. Participants performed a series of field tests to evaluate trunk flexibility, lower extremity and trunk power, and dynamic balance.

Results: The group with good mechanics demonstrated greater backward trunk flexibility ($p=0.02$), greater rotational power ($p=0.02$), and higher single leg countermovement jump ($p=0.05$). Reliability of the OTSA ranged from $K=0.36-1.0$, with the majority of all the nodes displaying substantial reliability ($K>0.61$).

Conclusion: This study provides HCPs with a valid and reliable field tool used to assess serve mechanics. Physical characteristics of trunk mobility and power appear to discriminate serve mechanics between players. Future intervention studies are needed to determine if improvement in physical function contribute to improved serve mechanics.

Level of Evidence: 3

Key words: Functional testing, kinematic analysis, tennis serve

¹ University of Kentucky, Lexington, KY, USA

² Shoulder Center of Kentucky, Lexington Clinic Orthopedics Sports Medicine Center, Lexington, KY, USA

³ Women's Tennis Association, St Petersburg, FL, USA

The authors wish to thank Dennis Van der Meer, Bruce Elliott PhD, Mark Kovacs PhD, Kathleen Stroia MS, ATC, PT, Todd Ellenbecker DPT, Paul Lubbers PhD, Raphael Bahamonde PhD, Murphy Jensen, and the Women's Tennis Association Sport Sciences & Medicine staff for their contributions to the development of the serve analysis tool.

CORRESPONDING AUTHOR

Natalie L. Myers

210c Charles T Wethington Building

900 South Limestone

Lexington, KY 40506-0200

E-mail: natalie.myers@uky.edu