



An Isokinetic Profile Of Trunk Rotation Strength In Elite Tennis Players

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ABSTRACT

The changes in stroke production in the modern game of tennis have increased the demands in trunk rotation in the elite tennis players. However, no study to date has objectively quantified side to side rotational trunk strength in these players.

Ninety-four elite tennis players were tested using a Cybex isokinetic torso rotation unit at a 60 and 120 degrees per second to measure left and right rotational strength. A subset of 28 subjects performed a functional series of medicine ball tosses using forehand and backhand movement patterns with a 6 pound ball.

A repeated measures ANOVA was used to determine side to side rotational differences and a Pearson correlation was used to test the relationship between the functional medicine ball toss and the isolated isokinetic torso rotation test results.

No significant differences in forehand and backhand trunk rotational strength was found in the elite male tennis players. In females, slightly greater backhand rotation strength was found at both testing speeds. Significant correlations were also found between the functional medicine ball toss and both forehand and backhand isokinetic strength variables.

These findings suggest that conditioning programs for elite tennis players should include exercises to develop bilateral trunk rotation to provide vital core stability to the spine and torso to meet the rotational demands encountered during tennis play.

INTRODUCTION

Musculoskeletal demands placed upon the human body during tennis play have resulted in a characteristic pattern of upper extremity injuries in tennis players. Injuries to the lower back can be included in among the characteristic injuries in elite tennis players. Rotation of the trunk during the tennis serve and groundstrokes is an integral part of the development of power and transfer of energy up the kinetic chain from the lower to upper extremities (Roetert & Groppel, Ellenbecker & Davies). The integral role that trunk rotation plays in tennis performance has led to a greater awareness and utilization of conditioning programs to improve core stability to enhance performance and prevent injury. However, little research is available to guide clinicians in the proper design of these stabilization programs nor is there an established method to identify player who are deficient in core strength and may require these programs.

PURPOSE

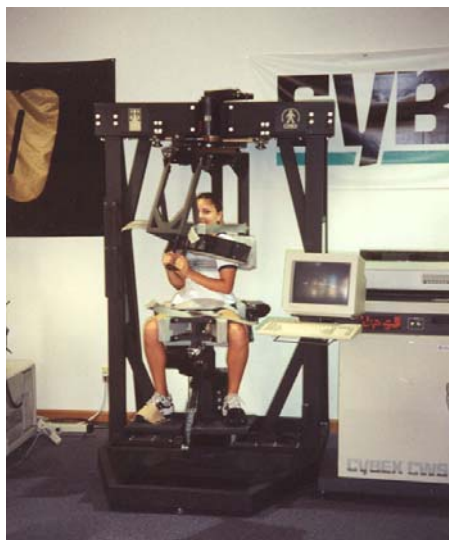
The purpose of this study was to isokinetically measure bilateral trunk rotation strength in elite tennis players and to determine if differences exist in side-to-side rotational strength. Additionally, the study sought to determine the degree of correlation between isokinetically measured trunk rotation strength and a functional medicine ball toss that uses trunk rotation.

PARTICIPANTS

- Ninety-four elite tennis players (45 males: ages 11-54, mean 25.5 years; and 49 females: ages 12-45, mean 19.2 years) with an average of 15 and 9 years of competitive playing experience respectively.

- All players were either ranked players and/or played in competitive tournaments at the high school, collegiate or professional level.

- Subjects were free from any back or pelvic injury and did not have a history of injury in the year prior to testing that had resulted in an inability to compete or practice.



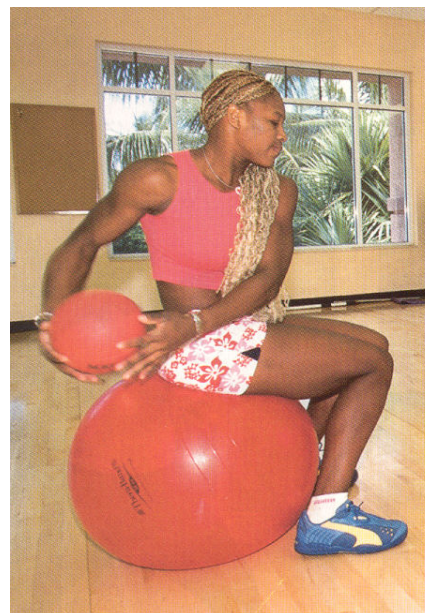
METHODS

- Following a brief warm-up, subjects were placed in the Cybex Torso Rotation isokinetic dynamometer (Cybex Inc, Ronkonkoma NY) in a seated position with 90 degrees of hip and knee flexion (figure 1).

- Five maximal repetitions at 60 degrees per second and 15 maximal repetitions at 120 degrees per second were performed. A 30 second rest period was allowed between sets.

- A subset of 28 subjects threw a six pound medicine ball, using both hands, in a forehand and backhand movement pattern from a stationary starting position (Figure 2).

- Two repeated measures ANOVAs were used (one for males and one for females) with dependent t-tests being used where main effect differences were identified. A Pearson correlation coefficient was used to determine the relationship between the isokinetic strength and functional medicine ball performance.



RESULTS

- No Significant strength differences were found in the male subjects between forehand and backhand rotational strength.

- Females demonstrated a significant (p<.001) side-to-side strength difference. Female subjects had significantly greater (p<.001) backhand rotation peak torque and single repetition work values at both 60 and 120 degrees per second as compared to forehand rotation.

- Significant (p<.001) correlations were found between the peak isokinetic rotational strength and both forehand and backhand functional medicine ball tosses (r=.80).

Correlations Between Peak Strength and Medicine Ball Toss (FHR=forehand, BHR=backhand strength).

Parameter	Forehand Toss	Backhand Toss
FHR 60	.836	.814
FHR120	.830	.820
BHR 60	.827	.787
BHR120	.825	.792

IMPLICATIONS AND APPLICATIONS

- Elite level players have very high levels of trunk rotation strength.
- Training methods should promote symmetrical strength development in forehand and backhand rotation.
- Players with side-to-side strength differences of more than 5-10% should perform exercises to balance trunk rotational strength.
- A medicine ball toss can be used as an effective field exercise to estimate torso rotational strength.

ACKNOWLEDGEMENTS

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