This research was funded by a USTA Sports Science and Medicine Research Grant (2002).

INTRODUCTION

• In the early 1900’s, concerns were raised involving the increasing speed of the game.
• This increasing speed is partially due to developments in racquet manufacturing technology that has produced relatively stiff and maneuverable racquets that have contributed to an increase in power for all tennis strokes.
• As a result, the increased pace of the incoming shots has reduced the amount of available preparation time for the tennis player, which has initiated changes in stroke mechanics and strategy among all skill levels of the game.
• Several solutions to the ‘power surge’ in tennis have been proposed including decreasing ball pressure, raising the height of the net, increasing the distance of the serve, and increasing the size of the balls.
• Among the above options, increasing ball size has been suggested as the most practical method to slow down the pace of the game. In addition to slowing play, the larger ball is thought to decrease reaction time due to its better visibility in comparison with standard sized balls.
• However, an oversized tennis ball may affect other dimensions of the game such as the racquet acceleration, muscular activity, and reaction time of the player.
• This study attempted to give more insight into the differences in initial shock conditions of the racquet between the standard and oversized balls during a volley.

SAMPLE

Participants for this project were 29 university students who played tennis recreationally.
• Gender: males (n=20), females (n=9)
• Age Range: 19 to 43 years (ave. of 23.6 years)
• Average Height: 5 feet 9 inches (174.3 cm)
• Average Weight: 164 lbs. (74.2 kg)
• USTA Rating (self-rated): 2.5 to 4.5

PROJECT METHOD

• Participants were asked to perform volleys under different conditions of ball type (standard vs. oversized), ball speed (44.7, 50.8, and 60.4 mph), and lateral contact location (forehand vs. backhand shots).
• During the volleys, the activity of select arm muscles were measured along with racquet vibrations after ball/racquet impact (acceleration) and the time it took players to initiate movement in response to ball projection (reaction time).

RESULTS

Reaction Time (from ball projection to players’ initial movements):
• There was no significant difference in reaction time among the different ball types.
• This finding suggests that oversized balls do not improve visibility to the extent that would allow players to determine the lateral location (forehand or backhand) sooner in volleys compared to regular balls.
• Significantly shorter reaction times were observed for fast speeds than for slow speeds.
• The reaction time for the forehand volley was shorter than that of the backhand volley.
• Movement time (i.e., the time between ball projection and ball/racquet contact) was increased when players volleyed an oversized tennis ball than when a standard ball was used.
• The benefits of the larger ball (to slow the game down) increase as the ball speed increases.

Racquet Vibration:
• Higher racquet acceleration levels were noted for the fast speed when compared to slow speed.
• The racquet acceleration for the forehand volley was found to be greater than that of the backhand volley.
• Greater vibration frequencies were found for the regular sized ball when compared to the oversized Wilson Rally ball.

Muscle Activity:
• Greater muscle activity was observed in the flexor carpi radialis (a muscle of the forearm that flexes and abducts the hand) for the backhand volley than the forehand volley.
• Greater muscle activity was found in the extensor carpi radialis (one of the five main muscles that control movement at the wrist) for the forehand volley than the backhand volley.

CONCLUSION

Overall, few significant differences among ball speed, ball type, and lateral location were found for muscle activity, racquet vibration characteristics and reaction times. However, the study did discover that oversized balls do have benefits in regards to the time players are allotted to position themselves for a volley return. In addition, these modified balls do not appear to have the negative consequences on player injuries that have been questioned by the tennis and medical communities.