



Effects of Biomechanical Feedback on the Tennis Serve

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INTRODUCTION-RATIONALE

- The tennis serve is a complex skill in which the performer attempts to coordinate the greatest controllable racquet speed at the time of impact with the ball. The skilled athlete learns to generate this swing with the effortless and rapid rhythm of knee bend, body and shoulder rotation, elbow flexion and extension, and downward rotation of the forearm.
- Feedback of the movements that make up a player's serve provides essential information for the learning and performance of the skill. Additionally, the accuracy and timeliness of the feedback will influence the individual's speed of skill acquisition.
- Customarily, tennis players rely on their coaches visual assessment (which may be inaccurate), the results of the serve (which is delayed), or self-perception of one's body position and movement (which may be inaccurate and is certainly delayed) to perfect their service motion.
- Consequently, the serve remains the most difficult tennis shot to learn, due in some part to the imprecise and delayed nature of the available movement feedback. This study looked to examine the usefulness of a biomechanical device in providing more accurate and immediate feedback to tennis players.

PURPOSE

The purpose of this study was to test if auditory feedback of players' service technique from a device known as the "Whistler" would help improve the performance of the tennis serve (i.e., service speed and accuracy).

SAMPLE

Participants for this study were eight recreational tennis players with an age range of 26 to 76 years and National Tennis Ratings between 2.5 and 5.5

YEAR PERFORMED 1991

METHOD

- The "Whistler" (.84 ounces) was placed on the midpoint of the players' racquet throats, and made a whistling sound at the moment of the athletes' peak racquet speed during the performance of a serve.
- Participants performed a series of four trial sessions with the goal of moving the whistle higher (which would signify a faster service swing) and closer to the maximum contact height of the swing (which was assumed to be an essential quality of a "good" serve). Video recordings were also taken to assess the accuracy of the players' serves.



RESULTS

- Participants reported their service effectiveness showed marked improvement because of the feedback provided to them from the Whistler.
- All players' achieved greater ball speed as a result of the Whistler intervention.
- However, because this improved speed was often accompanied by decreased accuracy, the analyses of the players' overall performance did not improve. More specifically, 46 serves were hit successfully before feedback was provided by the device and only 47 serves were performed successfully after the feedback.
- Interestingly, the players with lower ability ratings showed more improvement in serve speed and accuracy than the higher ranked athletes.
- This finding may be due to the better ranked players being more resistant to technique change and more strongly attached to their former techniques.



RECOMMENDATIONS

- While this study did not find significant improvements in the performance of the tennis serve with feedback, these results should be presented with a word of caution.
 - Because only eight players were assessed and because these athletes' abilities ranged greatly, the statistical analyses used were limited.
 - More research should be done examining the effectiveness of the Whistler with more players, while only looking at one ability level at a time (e.g., novices, then intermediates, then elite athletes).
- Many past studies have shown that feedback provides the essential element for learning a movement technique.
 - At the completion of a particular skill, a player can modify his or her following performances based on the knowledge of what happened and how it happened.
 - Simple skills can be learned through the knowledge of the result (KR) of a particular skill.
 - As the complexity of a skill increases, feedback information provided to a player must be more specific and precise. Therefore, with complex skills, knowledge of one's performance (KP) of the skill (e.g., the path or speed of one's arm swing) becomes more helpful than just the KR of one's serve.
 - Additionally, using a combination of both KR and KP may be more helpful than employing just one strategy or using a combination of KR and verbal encouragement/positive reinforcement.
 - The serve benefits from KP because this stroke occurs at the pace set by the player, occurs in a stable setting, and is performed similarly over a series of different events. However, skills such as the volley that are performed in many different situations, require quick and relatively unpredictable responses, and are dependant on one's opponent would benefit more from the more easily interpreted KR.

CONCLUSION

- The Whistler is a device that provides players with positive feedback because it only sounds when players were able to reach significant speeds.
- This type of reinforcement can create a rewarding and fun learning experience because it focuses on improvement and correct technique as opposed to drawing one's attention to performance errors.