

MYTHS AND REALITIES IN BADMINTON AND TENNIS STROKES

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Biomechanical research with application to sport skills is varied and usually based on the collection of sport skill data in some form. The research conducted by Gowitzke and Waddell on the power strokes of badminton and tennis was based on data collected from high-speed bi-plane cinematography of some of Canada's top-ranked players.

PREMISES

Several premises underly the badminton and tennis research which was initiated by the authors in 1975.

1. Elite athletes were chosen for filming because an explanation of their stroke techniques might be valuable in attempting to generalize to other populations including the beginning player.

2. Descriptions of the motor patterns employed by successful (elite) players in the performance of the power strokes were needed since most of the current explanations found in books and coaching manuals are based on what coaches and players perceive from their own experiences. It has been shown on numerous occasions that the human eye is incapable of seeing the details of motor performance, especially when an event takes less than a tenth of a second to perform.

3. These descriptions must subsequently be distilled to usable teaching clues and coaching cues so that coaches know what to say to players, how to say it, what to look for in performance, where to stand on the court to gain the best vantage point for each type of stroke, etc.

4. Explanation of what the players do must be coupled with a biomechanical analysis of why and how they do it in an attempt to explain mechanical and neurophysiological principles which may be operating.

HYPOTHESES

The research was conducted to support hypotheses that were contradictory to the opinions presented in most of the books and coaching manuals. An hypothesis held by the second author on the nature of power in badminton strokes was supported by follow-through positions of elite players shown in magazines and newspapers. Other hypotheses were determined based on basic biomechanical principles.

Some of the myths of the art of stroke production prevalent in badminton and tennis literature serve to bring attention to some of the long-standing coaching axioms. They are used here to highlight the results of the research.

1. The follow-through should "cross over" to the opposite side of the body. (The "cross over" is merely the result of the turning action of the hip and vertebral joints, and emphasis should be placed on a follow-through which moves the hitting arm forward toward the net and in front of the hitting shoulder.)

2. Forehand and backhand movement patterns are unrelated. (These two overhead strokes are intimately related because the path of movement which the upper extremity follows in the forehand stroke is identical to that followed by the backhand stroke only in the opposite direction.)

3. The backswing should occur well before commencing the forward swing. (It has been demonstrated over many years that there are many advantages of taking a backswing and, without hesitation, moving into the forward swing (sometimes referred to as "moving in loops") if the objective is power in the stroke. Chief reasons for the backswinging without hesitation relate to the length-tension relationships in muscle, the facilitation offered by the neuromuscular spindle, and the elastic components in musculo-tendinous junctions.)

4. In overhead strokes, the racquet arm should "brush past" the ear. (Once again, film of performances showed that all strokes are played with the arm well out from the head and with the trunk laterally flexed to facilitate the player's reach for the shuttle.)

5. To impart more force, the feet should stay in contact with the court. (It was easily shown that every stroke was taken while airborne; "every smash is a jump smash"; "every serve is a jump serve". Force gained by pushing against the court surface might be of advantage to the shot putter, but not to the badminton or tennis player who is trying to generate angular speed in the racquet head.)

6. To impart top spin, the racquet should roll over the ball. (Filmed performances of forehand and backhand ground strokes, taken at 300 frames per second, demonstrated that the ball was on the racquet strings less than 1/2000th of a second! Top spin is applied by moving the racquet across the ball from a low to a high position.)

7. A major source of power is gained from "wrist snap". (The popular concept of "wrist snap" is found in most badminton and tennis instruction manuals and refers to the method in which a player gains additional power in a forehand clear or smash or a tennis "cannonball-type" tennis serve. A recognition of what is truly happening

anatomically (found in only a few references) is that the forearm is turning and equally important, the upper arm is turning. The biomechanical terms for these actions in forehand strokes are pronation in the radio-ulnar joints and medial rotation in the shoulder joint. Similarly, for the backhand overhead strokes, the actions are supination and lateral rotation, respectively.)

Many of these "myths" were laid to rest by other researchers including Poole, 1970, Plagenhoef, 1971, Johnson and Hartung, 1974, but few or no racquet sports coaches bothered to listen. Even with the chiding of Rantzmayer in a popular 1977 article, the badminton coach continued to believe in the concept of "wrist snap". It is not surprising then that publications by Gowitzke and Waddell, two in 1977, four in 1979 and two in 1980, are still met with the same disbelief by coaches of badminton and tennis.

The use of the high speed cinematography camera to reveal details of motor performance which cannot be seen by the human eye has continued. The most recent data acquisition occurred during the second week in June 1985 when the authors filmed eight of the top 16 players in the 4th World Badminton Championships, held in Calgary, Canada. The film has not been analyzed but a cursory view of the players' performances indicate that the best players in the world perform strokes in the same manner as that described for elite Canadian players. Once again, it would appear that the problem is not one of biomechanically analyzing motor performance, but "bridging the gap" between the scientist and the coach or player.

REFERENCES

Gowitzke, B.A., Biomechanical Principles Applied to Badminton Stroke Production. Science in Racquet Sports, ed. J. Terauds. Del Mar, Calif.: Academic Publishers, 1979:7-15.

Gowitzke, B.A., Qualitative Analysis of Tennis Serve, Forehand and Backhand Drives: A Pilot Study. Unpublished research paper submitted to Tennis Canada, 1983.

Gowitzke, B.A. and D.B. Waddell, The Contributions of Biomechanics in Solving Problems in Badminton Stroke Production. Invited paper, Conference Proceedings, First International Coaching Conference, Malmo, Sweden, 1977, 11 pp.

Gowitzke, B.A. and D.B. Waddell, Technique of Badminton Stroke Production. Science in Racquet Sports, ed. J. Terauds. Del Mar, Calif.: Academic Publishers, 1979:17-41.

Gowitzke, B.A. and D.B. Waddell, Qualitative Analysis of the Badminton Forehand Smash as Performed by International Players. Proceedings: National Symposium on the Racquet Sports, ed. J.L. Groppe. Urbana-Champaign: The University of Illinois, 1979:1-16.

Gowitzke, B.A. and D.B. Waddell, A Force Platform Study of Overhead Power Strokes in Badminton. Proceedings: International Symposium on the Effective Teaching of Racquet Sports, ed. J.L. Groppel. Urbana-Champaign: The University of Illinois, 1980:37-47.

Johnson, M.L. and G.H. Hartung, Comparison of Movement Times Involving Wrist and Forearm Actions. Perceptual and Motor Skills, 39:202.

Plagenhoef, S.C., Patterns of Human Movement: A Cinematographic Analysis. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1971.

Poole, J.R., Badminton. Pacific Palisades, Calif.: Goodyear Publishing Company, 1969.

Poole, J.R., A Cinematographic Analysis of the Upper Extremity Movements of World Class Players Executing Two Basic Badminton Strokes. Ph.D. dissertation, Baton Rouge: Louisiana State University, 1970.

Rantzmayer, J., Wrist Snap - Myth or Reality? Badminton Gazette, 58:128-129.

Waddell, D.B., Coaching the Power Stroke in Badminton. Science in Racquet Sports, ed. J. Teravds. Del Mar, Calif.: Academic Publishers, 1979:16.

Waddell, D.B., Canadian Badminton Association - National Coaching Certification Program - Coaches Manual, 1st revision - Level II - Regional Coach. Ottawa, Ontario: Canadian Badminton Association, 1980, 133 pp.

Waddell, D.B. and B.A. Gowitzke, Analysis of Overhead Badminton Power Strokes Using High Speed Bi-Plane Cinematography. Invited paper, Conference Proceedings, International Coaching Conference, Malmo, Sweden, 1977, 12 pp.