

羽球正拍網前擊球動作之生物力學分析

2008. 5. 30

研究生：薛尹彰

指導教授：蔡虔祿



摘要

羽球網前球是所有的羽球技巧中最細膩也是失誤率最高的動作，而網前的基本擊球動作是以輕彈球、搓球及勾球為主。本研究的主要目的是比較八位大專男子甲組羽球選手網前正拍的輕彈球、搓球及勾球動作在運動學及肌電訊號的差異。運動學是利用Vicon動作系統(250Hz)擷取受試者身上反光球的資料，並經由Visual 3D算出運動學參數；肌電訊號是由Biovision生物訊號擷取系統(1000Hz)來擷取，並經由Dasy Lab 6.0的軟體來分析；所有參數均透過SPSS 13.0版統計套裝軟體計算，以無母數弗里曼二因子變異數分析來檢定，並使用Excel計算軟體進行三種動作的事後比較，顯著水準定為 $\alpha = .05$ 。其結果發現：擊輕彈球時，拍面與水平面的夾角較小(約30度)、肢段伸展較慢及擊球前上肢肌群有共同收縮的現象。搓球則有較快的重心位移、遠端肢段的伸展及肌群由近端到遠端依序發力的現象，造成較快的拍頭速度以削擊球頭，使球有偏轉的效果。勾球則有較明顯的身體偏轉、右上臂的內轉、前臂的內旋動作及較為傾斜的拍面現象，以提供較大的側向力來擊球。因此，在擊輕彈球時，為了要減緩拍面對球的反作用力，所以擊球的肢段動作要放慢；擊搓球時，為了要提供球較大的偏心力，所以要靠遠端肢段的伸展及身體重心的移動；擊勾球時，上肢動作要以能提供球側向力的上臂內轉、前臂內旋的動作為要。

關鍵詞：肌電分析、網前球、輕彈球、搓球、勾球

Biomechanical analysis of badminton forehand net shots

2008.5.30

Advisor : Chien-Lu Tsai

Graduate student : Yi-Chang Hsueh

Abstract

Net shot is the finest skill in the badminton game. The dab shot, the stab shot and the cross court net shot are the main techniques of this skill. The purpose of this study was to compare the kinematics and electromyography variables of forehand dab shot, stab shot and cross court shot of badminton. The subjects were eight elite collegiate male badminton players (ages: 21 ± 2 years; height: 176 ± 8 cm; weight: 68 ± 6 kg). The mark trajectories were collected by VICON system (250Hz) and the kinematic variables were computed by Visual 3D software. The electromyography variables were recorded by the Biovision system (1000Hz) and analyzed by the DasyLab 6.0 software. All the variables were tested by Friedman two-way analysis of variance nonparametric statistical test which was calculated by SPSS 13.0, and the post-hoc comparison were calculated by the Excel software, the significant levels as $\alpha = .05$. The results were: There was a less angle between the racket surface and the horizontal plane in the dab net shot, the players would slower the upper limbs stretch movement and co-contract the upper limb muscle groups before the contact point. The players performed the stab net shot with a faster COG displacement, stretched distal segments and a sequence burst in muscle groups of dominate limbs in order to make a faster racket velocity to stab the shuttle. The players performed cross court net shot with an obvious trunk rotation, upper arm interotation, forearm pronation and greater angle in racket surface with horizontal plane to hit the shuttle. We should slow down the movements in the dab shot to reduce the reaction force between the racket and the shuttle. The players should performed a faster stretch of distal segments and COG in stab net in order to create a greater eccentric force to hit the shuttle. The players increased the upper arm interotation and the forearm pronation to hit the shuttle by inward racket swing.

Key Words: EMG, badminton, net shot, dab, stab, cross court shot

謝誌

本篇論文能順利的完成，首先要感謝指導教授蔡虔祿老師悉心的教導，不論是實驗的設計上，還是最後結果的分析討論，都給予我相當多的建議及鼓勵，讓我獲益匪淺、受益良多，除此之外，老師在研究上的專業及態度，也是我未來應學習及努力的方向。其次，也要謝謝擔任口試委員的相子元老師及戴憲維老師，提供我多方面的意見，讓我能將此論文修改得更完善。

在實驗過程中，感謝大力相助的勇升、露敏、弘斌及沛蓉等同學，若沒有他們在實驗期間，犧牲自己的假期來幫我佈置場地及收集資料，單憑我一人之力，恐無法完成這項實驗。所以對於這群幕後的功臣的付出，讓我感激不盡。此外，還要謝謝在上課期間，幫我在校安置管理班級的事務的熊麗玲老師，讓我在研究所上課的期間，可以全心的投入。

最後，要感謝我摯愛的老婆佳娥，平日不但鼓勵及支持我在學業上的進修，在我進修時也一肩擔起家中大小的事務，讓我可以家庭、工作及學業上得以兼顧。因為有許多人的幫忙，才讓我能順利完成這篇論文，所以，謹以本論文獻給在背後支持我的老師、朋友及家人。

尹彰

2009/6