

23 The application of non linear edition system in table tennis match analysis

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1 Introduction

Because of the complexity and opponents' flexible application of ball games, a nonlinear relationship exists between the performance of the competition and athletes' qualities (Hohman, Lames, & Letzelter, 2002). Therefore, it is difficult to predict the athletes' performance in accordance with their qualities. Ball game is one of the events in which tactics are most required (Tian, 1988). The application of tactics, to a large extent, will determine the result of the matches.

Traditional methods of analyzing a table tennis match were based on statistics. Three - phase method has been used to diagnose the Chinese athletes' competitive form and to analyze their technology and tactics (Wu, Zhang, etc., 1996). A more detailed 10 - item analytical method was proposed to analyze table tennis matches by Li & Su (1998). Using performance diagnoses through mathematical model, Zhang & Hohman (2004) analyzed the characteristics of technologies and tactics of world's elite table tennis players.

Analyzing table tennis matches with nonlinear edition system have some advantages, e. g., (1) it provides with players more systematic and detailed information than characters; (2) it is more convenient to manage. The research explored how to use nonlinear edition system to make multi - media material for analyzing high - skill table tennis matches. The application of the system in the preparation phase of significant competitions was discussed.

2 Methods

Firstly, the video tapes of 9 matches, 45 games totally, were randomly selected, including 3 attack vs attack women's singles matches (14 games), 3 attack vs defense women's single matches (14 games) and 3 women's doubles matches (17 games). Then, they were processed, using computers, to multi - media video format. Finally, all the matches were tested by using nonlinear edition software (Windows Movie Maker 2.0, Ulead VideoStudio 7.0). All the work were completed by using the standard computers (Intel (R) ; Pentium (R) 4;

3 Results

3.1 Video format of analyzing technology and tactics

The definition of variant formats of video files and file size were tested, using Window Movie Maker 2.0 and Ulead VideoStudio 7.0. The result indicated that WMV (LAN Video 768 Kbps) is suitable for conducting the technological and tactical analysis in table tennis. Providing needed clarity, its file size is much smaller than that of others (table 1). The average file size of WMV (768 Kbps) format for a women's game was 34,323KB (maximum 52,311KB, minimum 18,395KB).

Table 1. File size of four common video formats for a table tennis game (KB)

Video format	M	Max.	Min.	n
WMV(768 Kbps)	34,323	52,311	18,395	45
WMV(2.1 Mbps)	91,843	139,900	49,202	45
MPEG 2	232,921	361,875	129,231	45
AVI	1,280,390	1,950,728	685,713	45

3.2 Rendering Time of Video File

The rendering time of video file is one of the main factors which affect the editing efficiency. In addition to the configure of a computer and the editing software, the video format is another critical element for the rendering time. In a standard computer the rendering time of a file of WMV (LAN Video 768 Kbps) format was 288 seconds averagely, much smaller than that of other formats. Averagely, it was 306 seconds for an attack vs attack women's singles game, 262 seconds for a women's double game, and 304 seconds for an offensive vs defensive women's singles game. (Table 2)

Table 2. Rendering time of 3 video formats (seconds)

Video format	M	Max.	Min.	n
WMV(768 Kbps)	288	456	155	45
WMV(2.1 Mbps)	519	806	274	45
AVI	500	771	264	45

3.3 Speed of video broadcast

The practice indicated that the speed of video broadcasts is suitable by 50% – 75% of original material for match analyses, among them 50% – 60% of the

speed is proper for women's singles and doubles, and 75% of the speed for matches between offensive and defensive player.

3.4 Structure of Analysis

The video analysis of table tennis matches may be divided into two kinds: multi-media and task-specific video analysis. The former is usually used in preparation training before important competitions, and the latter applies to study the opponent's techniques and tactics during competitions.

The figure 1 is the structure of multi-media analyses of Chinese women national table tennis team during preparation training for 2004 Olympics. It was divided into three parts. The first was title, match video and the description of main characteristics of the opponent, the aim of which were to offer a holistic effect to coaches and players. The second part was the critical content which divided the match into three parts, i. e. attack after service, reception, and rally to analyze. The third was the summary and the suggestions for the players.

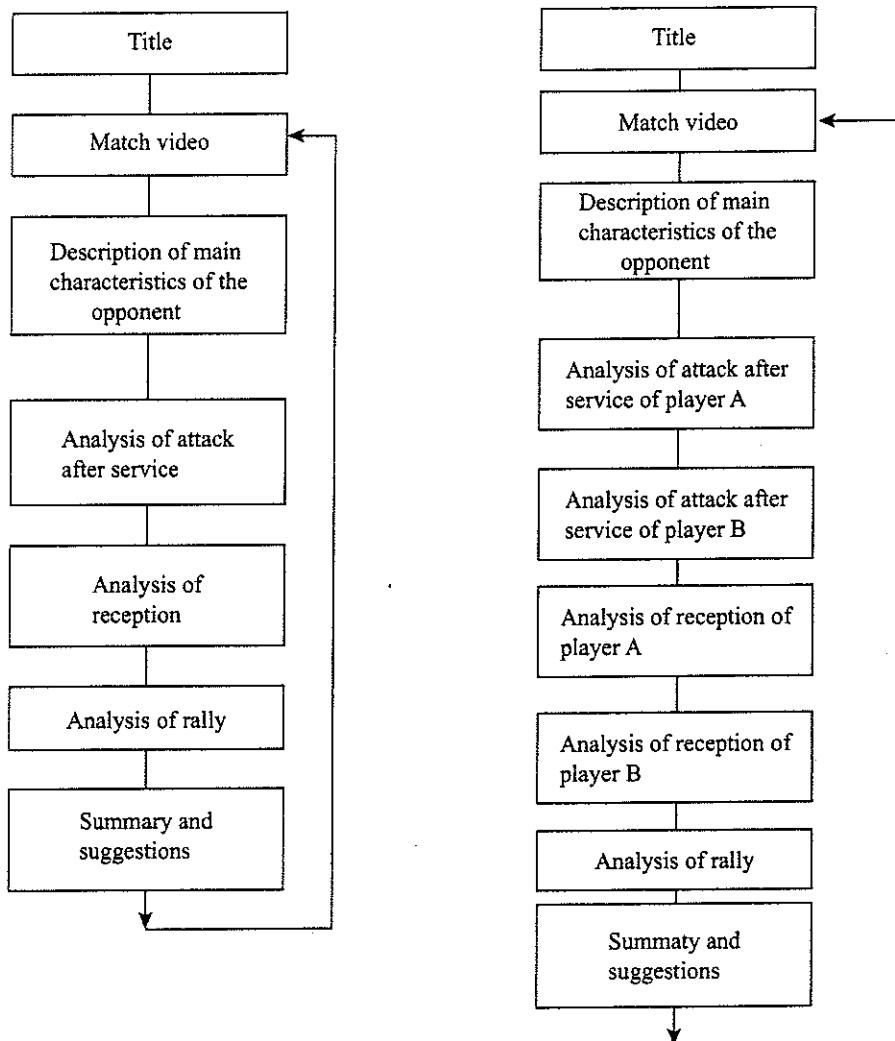


Figure 1. Structure of multi-media analyses

The structure of the doubles match analysis is similar to the above with the exception that the second part was divided into five subparts, i. e. attack after service of player A, attack after service of player B, reception of player A, reception of player B, and rally.

When a match between offensive and defensive players was analyzed, the second part of multi – media analysis was different, to a large extent, from the former two parts. Its main contents included offensive player's attack after service, topspin and smash, topspin, lift and smash, and defensive player's attack and lift.

In accordance with the feature of the preparation during the important competitions, Task – specific video analysis included the opponent's service, reception, and attack after service, scoring and losing feature after service, scoring and losing feature after reception, and critical points, etc. The aim of this arrangement was to provide easy way for the coaches and players to realize opponents' main features in technologies and tactics.

3.5 Application in Training

During the preparation training for 2004 Olympics of Chinese women national table tennis team, 9 seminars of multi – media analyses were conducted. The researchers firstly make the material in accordance with the opponent's playing ways. Before the seminar, the researcher and the coaches sat together to discuss the video displays and data. Finally, the coaches provided the summary and suggestions, guaranteeing the pertinence, practicality, and scientificity.

In addition, in accordance with the coaches' suggestions, the researchers had edited 10 matches to task – specific video data for coaches and players.

4 Conclusions

Nonlinear video edition software can be easily applied in analyzing players' technologies and tactics in table tennis matches on PC. The format of WMV (LAN Video 768 Kbps) is most suitable. And the speed of video broadcasts is practical by 50% ~ 75% of original material.