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Analysis of the Process of Improving Table Tennis Sports Game with Specific Interval Training

Dr. Meenakshi Tripathi*

Assistant Professor, Physical Education, Krishna Devi Girld Degree College, Lucknow, Uttar Pradesh

Abstract – One of the most popular sports worldwide is table tennis. Table tennis is now the seventh-largest sport in the world with a history of just over 100 years. It is however unclear whether the game is actually better or worse because of this improvement. A consistent approach to quantification is therefore necessary. Interval training is now an integral part of the training methodology. In general terms, each training is in a different sphere a form of interval training. The intensive periods of work and rest are repeated cyclically, but the true interval training must be observed in its own regularities. Interval training can be defined as a training method, comprising all training methods carried out on the basis of the interval principle, requiring a uniform change in load and rest periods. In this study, the improvements seen include physical games such as ball diameters, the rules of the game, set number and score limits. Moreover, compared to real ping pong The benefits of such improvements are also monitored at olympic matches. The results of the study demonstrate that it is beneficial to continuously improve table tennis.

Key Words – Sports, Table Tennis, Game Refinement Theory, Improvement Process.

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INTRODUCTION

Everywhere in the life of today, game problems are. The theory of games is widely used in finance, security, biology, economics, international relations, informatics, political science, military strategy and numerous other fields[1]. But little is known from the designer's point of view about mathematical theory. The theoretical aspects of the game that make games more attractive and sophisticated are interesting to know. The construction of the logistics model under Game Refinement (GR) theory [2] was carried out early work in this direction. The sports and chess games, as well as Mahjong, foot boarder or basketball games and other sports games was applied to board games and to sports games, including Tennis and Badminton[3]. Interval pauses to achieve total recovery are not used. Before the next load period, the player should not receive a total rest. Otherwise, the practice of intervals would not be fully effective. When it comes to interval training principles, which can be aerobic or anaerobic, related to energy consumption. Glucose and fatty acid combustion related to aerobic use with the use of oxygen. Anaerobic combustion is a planned way to generate oxygen debt energy. If a sportsman is more likely to develop energy based on oxygen debt, he or she is better prepared.

Ping-Pong is a popular sport worldwide; over the years, it has undergone several improvements, making it the world's seventh largest sport[6]. How has table tennis today become such a popular and attractive sport game? Although a number of iterations of the game review appear to improve the game over the year, it is not consistent. How much does it improve (or worse) the game and how does it change? In this paper, we will use GR theory to compare the differences between table tennis data before and after, and to assess whether such improvements are conducive to table tennis development.

LITERATURE REVIEW

A. P. Sutiono (2014) Sports are the games we know best and have been practically everywhere and in all cultures. Many sports in modern times have a long history, with decades or even a millennium. Your score-limit observations have a comparable value of game refinement. No new sport is table tennis. It was many times improved. A mathematical model based on this model has been proposed in previous studies which concentrated on uncertainty about game performance and game information. The value of game optimization is derived from the game information progress model. His second derivative, acceleration, offers us an

entirely new way of measuring a dynamic game or movement.

N. Nossal and H. Iida (2014) In this article, we will consider the application of GR theory to the rule changes of table tennis. The effect of rule change on GR value was also studied. In previous studies, it has been confirmed that several table tennis reforms from 1988 to the present are beneficial to the development of table tennis.

X. Hu (2014) Originally from England, tennis table. Tennis was popular in Europe at the end of the 19th century, but due to weather and court restrictions, certain college students in England shifted tennis to the inner table, put the book as a table and the parchment on the table. In 1890, a number of British naval officers stationed in India stumbled on a small platform to play tennis. They later use solid rubber instead of an elastic solid ball and then turn into a hollow plass ball. This table is the source of the table tennis named for this novel 'tennis.' Table tennis became a popular sport soon after its appearance. No uniform rules on table tennis were in place at that time. In one game, there were 10, 50 and 100 points. The international table tennis association was founded in 1926 with the increasing popularity of table tennis. There are 21 points per set of rules. The table is 146.4mm wide, the net 17mm high and the ball soft. The first world championships for table tennis started. The table was narrower under the rules, the net was higher and the ball was softer than it is today. Table tennis was still in its early days at that time. These conditions make the game of table tennis defensive.

F. Wei, F. Di and Z. Shouzhong (2010) Because table tennis was new, table tennis was very simple. Because the offensive approach is prone to errors, so each player has adopted a defensive approach. There have been many long matches under these circumstances. In the 10th world championships of table tennis, it took two hours and 20 minutes to fight for a point whereas seven and a half hours for the men singles match. Obviously, this situation is unfavorable for the development of table tennis. So the table tennis association improved its rules by widening the table (146.4mm - 152.5mm), reduces the height of the net (17mm to 15.25mm), and limits the time of the game. Long games were avoided.

J. Q. Liu, B. Wang, X. Zhao and Y. Dou (2014) Table tennis technology is constantly developing through the development of science and technology. In the 1950s, Japan invented sponge rackets and used the technology to the full. The invention of the sponge racket has enhanced table tennis speed and rotation. Henceforth, the offensive style of game play is the mainstream and the pace is accelerated. Then a sponge racket format was developed by the international table tennis association. In 1986, a clear distinguishability between the front and the back of the racket, with black at the top and red at the bottom, was stipulated. The racket's diameter and rubber particle height ratio is 1 to 1. Furthermore, Ping-Pong became a public Olympic Sport in 1988, promoting the development of Ping-Pong.

Since the 21st century, the tennis table has undergone huge changes. In 2000, the ball's diameter from 38mm to 40mm changed. The drag increases and the speed and rotation decreases with the diameter of the ball increasing. This improves the game such as reducing player mistakes, enhancing the aggression of the game and increasing the excitement of the game. There is a significant increase in rounds per point and the competition and enjoyment is increased. In 2001 it was transformed from the 21-point system into an 11-point system that shortens the time of each game and increasing the number of games.

The International Table Tennis Federation (ITTF) changed the international table tennis competition system from 21 points to 11 points on October 1, 2001. The 11-point system change and the implementation of increased competition results in randomness, reduce the grasp of the best players to win, so as to improve the appreciation of the game, and achieve the goal of the development of table tennis sports.

TABLE TENNIS SPORTS GAME DESIGN

One coach throws the ball in the game, controlling the time on the stop-watch (because of the change of the exercises). It is best when the players do the interval training in group – 3 player per group. While one of them works, the other one who has finished does the stretching and rests, than joins the third in gathering the interval balls in the basket. It is necessary to provide great number of the balls – 400 balls minimum.

- Purpose of specific interval training is development of the functional abilities of athlete's body to improve skills and all the motorical abilities important for table tennis and training.
- Exercise – the exercises are connected with improvement in area of aerobic

endurance, anaerobic endurance, speed, strength.

- Duration – all intervals for improvement of the different ability are different in ways of timing, aims and intensity.

GAME PARTICIPANTS

In the preparation phase of the European Championship the specific training in the period after the basic training took place with juniors and cadets, Yugoslavia's senior representation and India's senior male representation. The important improvements in the player's physical readiness, the strength of the game and consequently the quality of the game are evident after the recovery period (super compensation).

GAME PROCEDURE

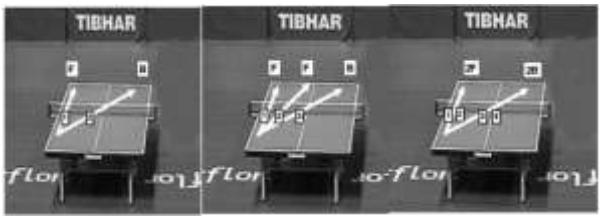
The pulse rate was measured to every player at the beginning and the end of an interval training. The intervals were recorded by the video-camera so that the intensity and the quality of work can be observed.

INTERVAL TRAINING 1 – AEROBIC ENDURANCE

Exercises:

INTERVAL 1

- Forehand topspin 2 backhand counter stroke or topspin - 4 min
- 1 and 2 forehand topspin (out forehand middle) 3 backhand stroke – 3 min
- 1 2 forehand topspin 3 4 backhand counter or topspin all from backhand - 3 min

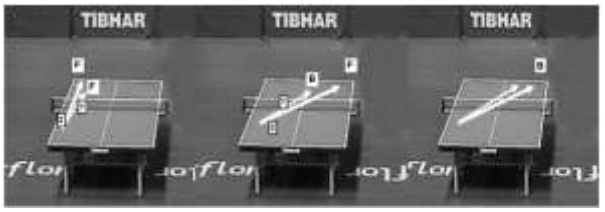


INTERVAL 2

- 1 backspin- backhand topspin 2 counter - forehand top spin - 4 min
- 1 backspin- forehand topspin 2 counter – backhand counter or backspin - 3 min
- 1 2 forehand topspin from forehand 3 4 backhand topspin or counter - 3 min

INTERVAL 3

- 1 forehand flick (backspin) 2 forehand topspin - 4 min
- 1 backhand flick 2 forehand topspin from backhand - 3 min
- backspin and counter – backhand topspin - 3 min



Number of intervals: 3

Pauses: for each player break is about 10 minutes

Number of balls per minute: about 50

Intensity: low and middle

Average values of the pulse rate at the beginning: about 98 – 105 – 110 bp/min

Average values of the pulse rate at the beginning: about 144 – 156 – 168 bp/min

INTERVAL TRAINING 2 – ANAEROBIC ENDURANCE

Exercises:

INTERVAL 1

- 1 2 forehand topspin from forehand - 5 min

INTERVAL 2

- 1 2 forehand topspin from backhand - 5 min

INTERVAL 3

- 1 (counter) backhand counter or topspin 2 forehand topspin from backhand 3 forehand topspin from forehand - 5 min

INTERVAL 4

- 1 (backspin) backhand topspin 2 forehand topspin from backhand 3 forehand topspin from forehand - 5 min

INTERVAL 5

- backspin – forehand topspin all table - 5 min

INTERVAL 6

- 1 forehand flick (backspin) 2 forehand topspin from backhand - 5 min

Number of intervals: 6

Pauses: about 5 minutes

Number of balls per minute: about 65 - 67

Intensity: sub maximum about 70-80% from maximum

Average values of the pulse rate at the beginning: from 105 – 110 - 120

Average values of the pulse rate at the end: about 175 – 180 – 185

INTERVAL TRAINING 3 – SPEED

Exercises:

INTERVAL 1 and 2

- 1 2 forehand topspin from forehand - 2-3 min

INTERVAL 3 and 4

- 1 2 forehand topspin from backhand - 2-3 min

INTERVAL 5 and 6

- 1 (counter) backhand counter or topspin 2 forehand topspin from backhand 3 forehand topspin from forehand - 2-3 min

INTERVAL 7 and 8

- counter throw all over the table without a plan – forehand topspin - 2-3 min

INTERVAL 9 and 10

- counter throw all over the table without a plan – forehand and backhand stroke- 2-3 min

Number of intervals: 8 - 10

Pauses: about 3-5 minutes

Number of balls per minute: about 4 – 5 ball in one interval, short rest, interval time about 1 – 1.15 min

Intensity: maximum

Average values of the pulse rate at the beginning: 100 - 110- 115

Average values of the pulse rate at the end: 168 – 175 – 180 – 185

SCHEDULE OF THE SPECIFIC INTERVAL TRAINING

This aspect is only a logical sequence of work with the development of a player's physical availability for this special interval training. It is a logical route from the basic preparation to the specific training until the ultimate is so specialized that the competition is structured and running until the competition begins. This training aspect can be applied to properly prepared players (the physical and technical readiness must be on a very high level). Because of the specific interval training should not neglect the classical "intervals" (various ball trainings) to increase stroke strength and singular technically tactical elements.

Table 1- Interval Training in a weekly system of training

DAY	TRAINING 1	TRAINING 2
MON	TABLE TENNIS	INTERVAL TRAINING (aerobic endurance)
TUE	TABLE TENNIS	INTERVAL TRAINING (anaerobic endurance)
WED	FREE	INTERVAL TRAINING (speed)
THU	TABLE TENNIS	INTERVAL TRAINING (anaerobic endurance)
FRI	TABLE TENNIS	TABLE TENNIS
SAT	FREE	TABLE TENNIS

In accordance to the above schedule it can be seen that the so-called "accordance" of the workouts is the best and most effective way to arrange workouts and intervals so as to make a co-compensation possible and to enable the player to develop the level of his readiness. Morning training is also in line with the above schedule, so that low intensity and longer duration control exercises are adjusted to the aerobic endurance afternoon training. The exercises with sub-maximum short duration intensity have been tailored to the afternoon anaerobic endurance training and the short maximum intensity exercises with pauses have been adapted to the afternoon speed training.

Table Tennis Ball Diameter

Although the diameter of the ball varies between 38mm and 40mm (2mm increase), many tests and televisions for such a change had been carried out. There was also a change of pace in the game, from the ball turn to the reaction of the audience.

Experimental data showed that increased ball diameter can ensure the ball game's display quality while having little effect on the players. The increase in ball diameter reduced rotation and ball speed from the physical point of view of the game to make it easier for the players to take the ball. The fastest speed and stronger rotation of the ball increased the players' difficulty each round before increasing the diameter of the ball. As a result, only a two or three rounds of every point in the game and even at the beginning of service were scored. Changing the ball size increases the game's enjoyment considerably, which is also justified by the GR increase. This increases the round number and makes the game more exciting.

TABLE TENNIS RACKET

The content of table tennis has undergone major changes in the last few years with a number of ITTF rules reforms. The surface reform of the ping-pong racket is pushed backwards by a series of rule changes like the small ball turning into a big ball, the larger ball becoming a larger ball, implementing the open service, prohibiting organic glue and so forth. The use of the new 40mm ball reduces its speed and turning particularly significantly. The attack speed and the threat of the first three rounds of tennis are considerable reduced while enhancing the fun of table tennis. The surface of tennis racket also corresponds with the further improvement and improvement of better playing power with regard to the new rules and keeping the game fresh. The use of new materials and advanced production technology, therefore, has gradually improved the efficiency of the racket surface in terms of hitting effects and power and increased the physical properties of table tennis manufacturers. Butterfly VISCARIA is one of the leading table tennis rackets on the market, the internal structure of which is structured in a 7-layer design, which enhances the bounce speed of a table tennis ball and increases the threat of attack while guaranteeing stability.

CONCLUSION

The aim of this research is development of technical and tactical abilities in top condition as a complete part of table tennis training. The body of athletes is very specific to "consume" this particular interval training, or this type of practice can be dangerous for a sportsman, if not properly prepared (overtraining, injuries, and etc.). However, this aspect of training delivered good results in a short time, increasing the skills and form of the player. The regulations on table tennis have constantly been updated and improved since the birth of table tennis in order to satisfy the requirements of their environment. There are three improvements. The table tennis rules were improved on an ongoing basis. Secondly, there were also constant improvements in the performance of table tennis. Thirdly, competitive equipment development and innovation are also observed. The GR [0.07, 0.08] is able to verify its changes for table tennis. In the GR theory, this value represents a balance between challenges and skills, making table tennis one of the world's most famous sports. The GR value for table tennis is shown to be stable gradually when GR [0.07,0.08] is used for this study. The improvement of the rules on table tennis facilitates the creation of table tennis, making it more popular. This study only takes into account the impact on table tennis of certain changes to the rules. There are other rules changes and factors, including the duration of the match, the number of services per point for table tennis games, etc.

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Corresponding Author

Dr. Meenakshi Tripathi*

Assistant Professor, Physical Education, Krishna Devi Girld Degree College, Lucknow, Uttar Pradesh