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ISO-9001 IMPLEMENTATION RESULTS IN PERFORMANCE SPORTS DELEGATION; CASE STUDY OF TABLE TENNIS DELEGATION IN FARS PROVINCE

Abstract

The role of scientific management and based on new principles in sport progress, is apparent. In fact, traditional management system is based on the individual experience of the manager itself and his or her colleagues to analyze and solve the problems, by which the percentage of error will increase; but if this experience, being settled with distinct building blocks of scientific control systems, reduces not only the percent of decision making errors, but also in the final adding up of the accomplished activities in defined time duration, will have aimed information with distinguished classification which are the most important tools in correct analysis of manager(s) in success and failure, progress and retrogrades.

The quality of management system, based on the ISO_9001 standards, since 2009 experimentally and on 2010 year, were applied officially in mega-management level of table tennis in the Fars province of Iran (the greatest province with more than 4 million people in the country). In this study, the implementation of ISO–9001 model of management in mega-managerial level of table tennis in the Fars province (especially in the specific committees level), and also its effect on different executive and technical level, have been investigated, even on the families of the players. Although in conducting such design, like to other changes, there were difficulties and oppositions, but utilization of team working and partnership management patterns and considering the motives of individuals, most of these resistance converted to accompaniment.

The results of this study showed that, application of new methods along with conventional management patterns in table tennis, has improved the results. During three years of conducting this design, the most qualified effect observed, had been the individual responsibility promotion, group working and disciplines which has resulted the indirect qualitative increase in promotion of championship and number of the interested public sector and financial supporters. Although, everyone knows, obtaining a result in physical exercise, depends on many factors which are out of this subject, but the implemented design in this province, showed that application of ISO-9001 patterns in sport management can promote the quality and quantity levels in the performance of a sport organization.

Keywords: *The ISO 9001:2008 quality management, table tennis delegation, Fars province*

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POINT BASED GAME ANALYSIS SYSTEM FOR TABLE TENNIS

Abstract

Due to the speed of the game match analysis is not an easy task in table tennis. We thought that rather than analyzing every single shot in a rally, the last action of each player would still give enough data to get an idea about the players. Game analysis is important both for analyzing the strengths and weaknesses of the opponent, but, it also give an idea about our player. Using the type and the frequency of mistakes during a match, we can organize the training sessions to work on these specific weaknesses. We can also use the system and find the appropriate tactic for a specific opponent. It is obvious that watching the opponent in advance can give us a good deal of information to develop a tactic. On the other hand using such a system can give us statistical information that we cannot see by just watching the opponent. What type of technique he/she uses most in his/her wins or loses? The match analysis we developed includes all possible techniques and all possible sites on the table. The last shot each player executes is recorded. The basics idea is to put each point in the relevant box. If the player wins the point the point is written in the upper portion of the box and if the player looses the point the number is written on the lower portion of the box. It takes some time to get used to the system but after completing a couple of matches the coach or analyzer get used to the system and easily completes the form. We suggest rather than coach making the analysis, players should do it and therefore they can get a better idea about their opponents or the tactical structure or the other players.

Keywords: *game analysis, statistics*

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MUSCULAR STRENGTH, MUSCLE ACTIVATION PATTERNS AND KINEMATICS DURING FOREHAND LOOP

Abstract

Table tennis involves high activation of quadriceps muscles especially during forehand and backhand loops. It can be seen that table tennis players now have huge quadriceps muscles. Coaches\ especially at high level started to include more physical training like squats and leg presses to strengthen the lower extremity. During forehand loop the strength comes from the lower extremity. The body should work as a kinetic chain and therefore each muscle in the chain has to be enough strong that the whole action is executed in a harmony. If any part of the chain is weak it will affect the performance and also may result in injury.

The strength ratio between quadriceps and hamstring muscles should be around 60 %. If the players have strong quadriceps muscles and weak hamstrings, the stress on anterio-cruciate ligament (ACL) increases. ACL is responsible for restraining the anterior motion in tibia. So, when strengthening the player's quadriceps muscles the coaches should also include some hamstring muscle strengthening exercises in physical training sessions.

In this research, we seek to understand the muscular activation patterns during forehand loop and also the ratio between the quadriceps and hamstring muscles of experienced table tennis players. First, we used Biodex isokinetic dynamometer system to see the quadriceps and hamstring muscle strength. Then, we asked our participant to execute forehand loops, standing on a custom made 1.2x1.2 m force plate wearing MTX accelerometer system, which gives us kinematic data. We also used wireless EMG system (Delsys Inc.) to understand the muscle activation patterns during forehand loop.

We found low quadriceps/hamstring ratio in strength measurements. The ratio is approximately 45 %, which is so low that can result in ACL injury.

We are still collecting data for the kinematic and EMG analysis.

Keywords: *forehand loop, EMG, quadriceps/hamstring ratio, kinematics, kinetics*

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A COMPARATIVE STUDY ON SKILL RELATED PHYSICAL FITNESS OF TABLE TENNIS RELATED SPORTS

Abstract

Although table-tennis, badminton, and tennis all rely on quick movements and swift reflexes to affect the outcome of a match, but table-tennis players move shorter distance, making reflexes a critical element of victory.   **Goal.** The purpose of this study is to analyze the skill related physical fitness of table-tennis compared to tennis and badminton to give coaches a future frame of reference in training and curriculum choice.   **Method.** The subjects of this study are high-school students in division 1 sports categorized into table-tennis, tennis, and badminton. There are 12 subjects in each category totaling 36 subjects in this experiment. This study evaluates 12 categories including height and weight, body mass index (BMI), forward squat, standing long jump, grip, sit-ups, 3 minute step climbing, body composition, reflexes, 30 meter dash, vertical jump, balance, anaerobic power, triple standing jump, T agility test, and 1600 meter run.   **Results.** There is a significant difference in the categories of weight, reaction time, reflexes, grip, forward squat, explosive power, explosive speed, anaerobic explosive power, fatigue index, and stamina between table-tennis and badminton (p < 0.05). There is a significant difference in standing long jump, explosive power, explosive speed, and stamina index between table-tennis and tennis (p < 0.05).   **Conclusion.** Table tennis has superior performance in the categories of reaction time, reflexes, standing long jump, explosive power, explosive speed, and grip. It is recommended that these aspects be emphasized in future training regimen.

Keywords: *table tennis, physical fitness, reaction time*

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THE EFFECT OF USING SANDPAPER, HARDBAT AND RUBBER TYPES OF RACKETS IN THE PERFORMANCE OF ELITE TABLE TENNIS PLAYERS DURING THE 2012 14TH UNIVERSITY OF PHILIPPINES CHANCELLOR'S CUP NATIONAL TABLE TENNIS INVITATIONAL TOURNAMENT

Abstract

Since the inclusion of "liha" (sandpaper) and hardbat rackets in the regular events of the Philippine national open table tennis championships in 2008, there has been a significant increase in participation among elite Filipino table tennis players especially those who belong to the middle ages and has retired from sponge rubber play. This prompted the researchers to come up with a descriptive study to compare the differences in using sandpaper, hardbat, and rubber rackets during the 14th university of Philippines chancellor's cup national table tennis invitational tournament from 17 to 21 October, 2012. A special event, tri-bat event, was introduced using sandpaper, hardbat, and sponge rubber rackets. Eleven (11) participants with different racket orientations including an American and 2 local players/researchers in this study participated in this event. The rule was for a player to reach thirty points in order to win the match with both players using the same sandpaper, hardbat, and sponge rubber types of rackets alternately after every ten points combined. Statistical differences were analyzed using the t-test for independent samples to determine the differences between the three types of rackets. The Spearman rank correlation was also used to determine the significant relationships between the total points earned for each player and the final rankings. The results showed that there were no significant differences between "liha" and hardbat (p=0.606), hardbat and sponge rubber (p=0.767), "liha" and sponge rubber (p=0.445). This clearly indicated that the players have more or less the same level of play even with less or no experience in using other types of rackets. Although, the players who placed in the final top 4 rankings are somehow familiarized with at least two types of rackets than the other players who only use one type. The results also showed that there is a significant relationship between the total points earned for each player and the final rankings (p= -004). This means that the players who have higher points earned clearly finished in the top rankings. The use of different types of rackets with less familiarization does not prove how good a table tennis player is. There are chances that players who are extremely good in using one type of racket can still be beaten if using other types. It is recommended that to be able to play in such an event, players should use other types of rackets to get familiarized and land in the top rankings. Also, more participants should be included to gain more significant results.

Keywords: *"liha", hardbat, sponge rubber, tri-bat event*

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ANALYSIS OF THE TACTIC AND TECHNIQUE OF CHINA TABLE TENNIS PLAYER MA LONG

Abstract

By applying reviewing documents, analyzing game video and statistics, the tactic and technique of the world champion table tennis player Ma Long in three matches at the world cup 2008 and three matches at world ground tournament 2008 were analyzed, and found that Ma Long's tactic and technique of service has been steadily improved and stable, and he has diversified the method of return-service and attack. While his technique of service, return-service and attack was overpowered by his opponent, his performance was not as good as he was. Ma Long is good at persistence and has some advantage in speed, however, he may need to improve on his aggressiveness. In current stage, how to improve the execution of Ma Long's forehand attack should be the most important issue.

Keywords: *table tennis, Ma Long, tactic, technique, analysis*

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THE STUDY OF HOW DIFFERENT FEEDBACK METHODS AFFECT THE LEARNING OF A NOVICE TABLE TENNIS PLAYER DURING THE FOREHAND GRIP SERVE

Abstract

The purpose of this study was to investigate the variation between different feedback methods to learning of a novice table tennis at forehand grip serve. Thirty-six 5th grade students were inexperienced in forehand grip serve were selected as subjects. Via skill pre-test, they were divided into four groups, containing verbal feedback group, verbal and body assistance feedback group, verbal and video tape feedback group, and control group. Each group included 9 students (average11.26 ± 0.43 years in age, average145.26 ± 6.59 cm in height). The experiment was conducted during a 5 day period, with sessions of 20 minutes each day using 90 balls. After the 5th day of the experiment, the post-test would be held and the retention-test would proceed in the next week. The result was analyzed by two-way ANOVA mixed design of PASW 18.0 for Windows. Tested to acquire the difference in skill of performance and learning during the different test time and feedback methods, the significant levels as α = 0.05. This study was as follows: (1) each type of feedback can improve the skill of the forehand grip serve in a novice player's performance. (2) Each type of feedback has a positive impact to a novice player's learning of the forehand grip serve. (3) Every kind of feedbacks for the beginners' forehand grip serve learning does not show remarkable differences. (4) The decision of the feedback type should be selected by the complexity of movement learning.

Keywords: *verbal and body assistance, verbal and video tape*

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STUDY OF THE CORRELATION BETWEEN THREE-STAGED TECHNIQUES AND PRE-EVENT ANXIETY OF COLLEGE TABLE TENNIS PLAYERS IN MEN'S DIVISION B

Abstract

The purpose of the study is to understand the technical indication value of the three-staged techniques by investigating its correlation with the pre-event anxiety of college table tennis players in men's division B. A total of fifty-four male table tennis players from four different schools served as subjects of the study. With the registration form and analysis chart of table tennis three-staged techniques, Sport Competition Anxiety Test (SCAT, Lu, Chun-Hong's version) and Competition State Anxiety Scale-II (CSAI-2, Huang, Ying-Zhe's version) as analyzing tools, data gathered are further verified by adopting three-staged techniques evaluation criteria and Pearson product-moment correlation. Study results can be concluded as followed:

1. By looking at three-staged techniques, Taiwan's college table tennis players in men's division B, both 'Scoring rate in stage of serving attack' and 'Using rate at stalemate' are at the level of failed. Whereas 'Using rate in stage of serving attack', 'Scoring rate in stage of Receiving-serve attack', 'Using rate in stage of Receiving-serve attack' and 'Scoring rate at stalemate' are above the level of 'pass'.

2. The correlation between three-staged techniques and pre-event anxiety in Taiwan's college table tennis players in men's division B are:

2.1. In trait anxiety and three-staged techniques there are only 'Scoring rate in stage of serving attack' and 'Scoring rate in stage of Receiving-serve attack' reaching obvious correlation ($p < 0.05$).

2.2 In table tennis three-staged techniques and pre-event cognitive anxiety, there are only 'Using rate in stage of serving attack' and 'Scoring rate at stalemate' reaching obvious correlation ($p < 0.05$).

2.3. In table tennis three-staged techniques and pre-event somatic anxiety, there is only 'Scoring rate in stage of serving attack' reaching obvious correlation ($p < 0.05$).

2.4. In table tennis three-staged techniques and self-confidence, there are 'Scoring rate in stage of serving attack' and 'Scoring rate at stalemate' reaching obvious correlation ($p < 0.05$).

Keywords: *table tennis three-staged techniques, table tennis, trait anxiety, pre-event state anxiety*

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LOW COST MOTION SENSING OF TABLE TENNIS PLAYERS FOR REAL TIME FEEDBACK. NOVEL PERSPECTIVES FOR LEARNING AND ENTERTAINMENT IN TABLE TENNIS

Abstract

There is a growing demand for visualizing and analyzing data in sports sciences whether it is for professional athletes to enhance their performance, educational applications or entertainment. We present here a motion capture device we applied to table tennis that was originally developed for gestural control of sound and music. A six degree-of-freedom sensing device, inserted into the racket handle, measures 3D acceleration and 3-axis angular velocity values at a high sampling rate. The data are wirelessly transmitted to a computer in real-time. This flexible system allows for recording and analyzing kinematics information on the motion of the racket, along with synchronized video and sound recordings. Recorded gesture data is analyzed using several algorithms we developed to segment and extract movement features, and to build a reference motion database.

Importantly, the collected data can also be used for real-time sonic feedback conveying additional information to the player. Table tennis players already constantly integrate information about sensory inputs, mainly vision and proprioception, with extremely fast processing and triggering of motor commands. The auditory modality remains largely available without interfering with other modalities and can be processed rapidly. Therefore, sound can be an effective way to provide extra-information in real-time to the player during practice. Combining movement analysis with sonification techniques can provide players with direct information for self-assessment of the quality of strokes or for the intention of the opponent. This allows for new perspectives of the representation of the players' motion.

This experimental study first aims at demonstrating the potential of this low-cost movement sensing for analysis of the gestures performed in table tennis. Second, it investigates the potential value of experiencing sounds embodying player's movements. Current developments focus on using real-time sonic feedback of motion and to evaluate the benefits of such systems in sensorimotor learning, at both competitive and recreational levels of playing.

Keywords: *sonification, movement analysis, biomechanics, sensors, motor learning, auditory feedback, gesture, sound*

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A STUDY OF UNIVERSITY AND COLLEGE DIVISION I TABLE TENNIS PLAYER'S CAREER PLANNING

Abstract

Athletes often concentrate on training, but lack learning information about career planning. After retiring, athletes usually don't know what job to do. The purpose of this research was to explore university and college division I table tennis players' career planning, and the different situations in their career planning in different background variances. Through questionnaires whose objects were players having attended the university and college division I table tennis in 2012, there were 285 valid copies of questionnaires retrieved in total. The result was based on descriptive statistics and one-way MANOVA, which leaded to the conclusions as follows: (1) university and college division I table tennis players had better performance only in their self-exploration, and because the athletes were in a closed training environment, they had fewer chances to expose themselves to outside areas, and thus the players had narrow living environment, which leaded to worse performance in their career exploration, along with career selection and career planning. (2) it showed significant variances in players' career planning if they had different genders and grades, and whether they take educational courses and whether they receive sponsor by the enterprise also made a difference. It also showed less significant variance if the players attend different schools and departments. Suggestions of this study as follow: (1) to provide help for career planning; (2) to impetus athlete's career planning concept; (3) to increase opportunities for career exploration.

Keywords: *career planning, division I, table tennis*

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SENSORI-MOTOR RHYTHM NEUROFEEDBACK INCREASES FINE MOTOR SKILLS IN ELITE RACKET SPORT ATHLETES

Abstract

Neurofeedback (NFB) consists of operant conditioning of targeted components of the EEG in real time to alter underlying cortical oscillation. To investigate the hypothesis that NFB training to enhance the sensorimotor rhythm (SMR: 12-15 Hz) of the lateralised motor cortex controlling the dominant hand will facilitate accuracy of fine motor performance, ten elite (British national squad) table tennis players were measured on service accuracy before and after SMR NFB or mock-NFB training. Due to low statistical power most results were at trend ($p < 0.1$) significance level. However large effect sizes were obtained for linear trends of SMR band power across within-session trials suggesting the presence of a training effect at the cortical level. Importantly this was supported by behavioral results for service accuracy which showed a trend for increased accuracy across training sessions in the real as compared to the mock NFB training group, also with a large effect size. The SMR protocol used here shows promise as a training tool to further improve the performance of fine motor skills in elite athletes. Further research is needed however, to address the power issue and to determine the underlying neural mechanisms responsible for performance enhancement.

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Keywords: *Neurofeedback, table tennis, athlete performance enhancement, EEG, fine-motor skills*

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ANALYSIS OF QIANSANBAN TECHNOLOGY OF CHINESE EXCELLENT TABLE TENNIS ATHLETES

Abstract

QianSanBan played an important role in table tennis match in recent years. In this abstract, we analyze QianSanBan of Ma Long and Zhang Jike, who are among the top 5 table tennis players all over the world.

By manually labeling and summarizing the video for 2012 Olympic Games, we found that more than 60 percent points are gotten with in QianSanBan. The characteristics of both players at each stage of QianSanBan are listed as follows.

Service: Ma Long is good at combing the long/short/spin/non-spin serves, while Zhang Jike usually makes straight long side-spin in addition to short angled spin/non-spin. We suggest that both players pay more attention to the position of the service. Return of service: Ma Long favors controlling, as a result he usually makes angled short down-spin in addition to straight long down-spin, while Zhang Jike likes large angle backhand Ning Tiao, and high stability however the junction with his next board is relative weak. We suggest Ma Long to be less conservative and more initiative, and Zhang Jike pays more attention to the power of his return. Both players has strong willing to attack after serve with straight top-spin in addition to angled top-spin, however the return is of low quality and easy be counterattacked. We suggest both players strengthen the power of the attack. Both players the fourth cricket boll single, defensive consciousness is weak. We suggest them to exercise more to improve their defense power.

Keywords: *QianSanBan, Ma Long, Zhang Jike, statistics*

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CONSTRUCTION OF A GAME HANDICAP RULE IN TABLE TENNIS: A PROBABILISTIC APPROACH

Abstract

The development of a handicap game rule is an essential step in all sports. Indeed, allowing two players of different rankings, to measure rebalancing chances of winning the one and the other is a necessity in training as in some competitions. For some sports like tennis (Gerville et al., 2009) or golf, the concept of handicap game is at the origin of the rankings themselves. We propose in this communication a method for estimating probabilistic distances between rankings table tennis players. These distances are then used to build a handicap game rule. In most of French competitions, matches are played in best of 5 games of 11 points. It is possible to relate the probability of winning a handicap game match P(p,H) as a function of the probability, p, of winning a point (see Sarfati et al. (2000) for tennis without handicap game).

$$P(p,H) = P_{GM}(p,H)^3 + 3P_{GM}(p,H)^3\big(1 - P_{GM}(p,H)\big) + 6P_{GM}(p,H)^3\big(1 - P_{GM}(p,H)\big)^2$$

$$\text{avec } P_{GM}(p,H) = \sum_{i=0}^{9} C(11+i-H-1;i)p^{11-H}(1-p)^i$$

$$+ C(20-H;10)p^{11-H}(1-p)^9 \frac{p(1-p)}{1-2p(1-p)}$$

From the current method of French ranking rule and using the Bradley-Terry's model, we are able to determine the probability of winning the game according to the difference in rating between the two players. Then, with the resolution of the above equation, we are able to propose a handicap game rule depending to the gap between the two ranking players.

Ranking gap	0-99	100-199	200-299	300-399	400-499	500-599	600-699	700 and more
Points give to the lower player	0	+1	+2	+3	+4	+5	+6	+7

For example, with the French ranking rule, if the difference in rating between the two players is 215 points, the lowest ranked player begins each set with 2 points.

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Keywords: *zero-sum games, win probability, game handicap*

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THE EFFECTS OF PASSIVE WARM-UP IN TABLE TENNIS PLAYERS

Abstract

Background. Warm-up before exercise could increase blood flow of whole body, increase muscles and skin temperature, prevent injury within exercise. Passive warm-up can increase temperature of muscles as active warm-up do, but it won't cause the muscle fatigue. To use heat packs or to apply ultrasound is the way for passive warm-up.

Purpose. To determine the effects of two different modalities of passive warm-up and exercise without warm-up on exercise performance and recovery on muscle damage in table-tennis players.

Methods. Eight table-tennis players volunteers participated in this study (age = 23.88 ± 5.06 y), and all of them were involved into three groups as control group (CON), heat packing group (HP) and ultrasound group (USD). CON never received any warm-up protocol before eccentric exercise, HP received 15 minutes of superficial heat with electrical heat pack before exercise, and USD received 7 minutes of deep heat with ultrasound diathermy before exercise. Each subject processed 30 repeated bouts of eccentric exercise with 80% MVC level. Serum CK, MVC, ROM and CIR were measured before, immediately after exercise and at 2nd, 4th, 7th, and 10th days post-exercise.

Results. When measuring serum CK and CIR, there were no significant differences between CON, HP and USD ($p > 0.05$). When measuring ROM and MVC, there were significant differences between CON, HP and USD ($p < 0.05$).

Conclusion. USD and HP have better muscle strength and performance than CON. According to the recovery procedure, USD took lesser damage on muscles than HP and CON. USD had lesser swelling then HP and CON in recovery stage after exercise.

Keywords: *passive warm-up, muscle damage, ultrasound*

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RESEARCH ON THE DEVELOPMENT OF CHOP-ATTACKING SKILLS OF TABLE TENNIS

Abstract

Objective: it has been promoting a variety of skills which contend and constraint with each other in the developing process of table tennis. Among the skills, chop-attacking (CA) has made outstanding contributions to the development of table tennis for China and all of the world. In recent years, table tennis skills have gradually developed to speed, strength, strong rotation, and affected by the rules and equipments, with the result that CA players encountered unprecedented difficulties. Thus, the purpose was to analyze the reason of the difficulties.

Methods: related documentations were used as the research foundation, and famous Chinese table tennis experts were interviewed. In addition, the table tennis matches videos of the excellent CA players were observed.

Results and suggestions: (1) objectively, CA skill has much difference in plate shape and power application. Meanwhile, under the same training time, CA players need to practice the chopping and attacking skills; (2) subjectively, the main factors restricting the development of CA players are decline in the rate of attacking after service utilization and lack of return of service consciousness. The last but not the least is deficiency in the tactics of force angle attacking; (3) in the training and matches, after unblocked service, it could increase the concealment by increasing the service speed, thus improve the usage rate of the angle shot and gain the initiatives in the technical and tactical. When receiving, it should innovate in some details such as foot station. Studies suggest the current stance of CA players generally use feet standing in parallel which relatively conservative. It may appropriate to mock attack player foot station, enhance the training on offensive footwork, expanded attack space, and strive to take the initiative; (4) in the case of force angle attack skill becomes ever harder to use, it may accelerate the speed before and after chopping, and adopts the positive and proactive means of defense as well as on the basis of chopping steadily through adjusting the contact point to accelerate the attack speed of chopping and attacking, so as to build a reasonable system of CA skills and tactics.

Keywords: *table tennis, chop-attacking, development*

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A STUDY OF BRAND IMAGE OF CORPORATE SPONSORSHIP ON TABLE TENNIS

Abstract

The effectiveness of sports sponsorship is huge; it has contributed to the corporation and sports organizations which complements each other and creates a win-win situation. Corporate sponsorship plays an important role to table tennis development and corporation's brand image is a key to success in business. Therefore, this article has focused on the brand image sponsored by corporation and its influence on corporation development. The result is provided for corporations as strategy in brand image sponsoring, and thereby increases the possibility of corporate sponsor in table tennis. By studying relevant literatures, results indicated that: (1) sports sponsorship could create positive effect on brand image. The closer the connection between corporation and the events sponsored by it, the positive attitude of consumers have toward the image of the brand increase. (2) Rewards sponsored by corporation for table tennis is mainly money, followed by tournament and products. The tournament and the products as prizes created better corporation image than money does in corporate sponsorship. (3) Different backgrounds of table tennis participants result in different reflection of brand image, especially involvement and interest. Suggestions: (1) corporate sponsorship for table tennis could focus on building the image of "table tennis enterprise". In addition to long-term investment and cultivation in table tennis players, promotion strategies are encouraged to use which provides corporate information for people as well. (2) Corporation could sponsor more table tennis tournaments and non-profit activities in different places to increase corporation image. (3) For different consumer groups to create different strategies through corporate sponsorship in order to attract consumers' interests. This article expects enterprises to enhance the brand image through diverse sponsors table tennis, and create positive influence on table tennis development to produce win-win situation.

Keywords: *corporate sport sponsorship, table tennis, brand image*

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PROFILING: A DESCRIPTIVE STUDY OF VISUAL STATUS AND DEMAND OF THE UNIVERSITY OF THE PHILIPPINES TABLE TENNIS VARSITY TEAM

Abstract

A descriptive study of the visual status of the table tennis varsity team of the University of the Philippines and the relation of the visual demand of the sports discipline they are on to. The materials gathered are strictly the visual status and information acquired during the visual screening testing. The purpose is to present the visual status of the whole varsity team. This study is to present that table tennis has been identified as a very visual demanding sports. The athlete who has been identified as having visual problems might not cope-up with the visual demand or rather will not be able to maximize the full potential he/she has; often than not resulting to frustration and failure to achieve his/her performance during training or yet at competition. Eye teaming is very important in our day to day activities regardless whether you are into sports, academe, professionals or any field that requires the use of two eyes. It aims to help athletes and coaches on problems that manifest during training may be repeated and reveal during competition. Such as returning a short ball, long ball or middle ball etc. Poor eye teaming often results to delayed reaction time, poor judgment of distances, poor concentration and the likes. After determining the visual status of the team, it will be compared to the visual demand of the sports analyzing and tabulating the results for easy presentation. The visual status of the varsity team was established and recommendations are suggested to correct what needs to be done. The relevance of the recommendation is to be able to maximize the full potential of the varsity team while they are on training and even during competition.

Keywords: *visual screening testing, eye teaming*

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THEORETIC AND PRACTICAL RESEARCH ON IMBALANCE COMPETITIVE OF THE WORLD TABLE TENNIS

Abstract

Currently the development of world table tennis takes on an imbalanced status. The Chinese team is mighty and outshines other countries by pocketing almost all the gold medals. The medals are mainly distributed in European-Asia areas, and other areas seldom get any; this imbalance still continues and enlarges. In order to continuously promote the popularization of the world table tennis and to improve its worldwide athletic level so that this sport can develop healthily.

This paper has used the methods of documentary searching, expert interviews, statistical ways, logic analysis, comparative analysis to analyze the current developing status of world table tennis competition, including the typical technical characteristics that have been attached to good competitive results in the four different stages of table tennis development and the athletic performances of the Three Great Events. The main conclusions are as follows:

1. Reasons for imbalance of table tennis development: degrees of understanding and handling the winning rules; innovative degree of techniques, playing methods, equipments, etc. and the scientification of training methods and administrative systems; the importance to a country and its popularization in this country; a country's cognition of table tennis development and the country's economical development level.

2. Aiming at the current situation of competitive imbalance in table tennis development, these countermeasures should be considered and taken: the table tennis practitioners of all countries should be dedicated to researches in winning rules of table tennis, and optimize and combine the five main factors of table tennis. We should also have the courage and faith to innovate continuously and commit ourselves to innovations of techniques and tactics, playing methods, theories, equipments, etc. We should increase the scientific contents of innovation, strengthen and perfect administrative systems, training methods and handle news trends of technique development. ITTF should continue to modify and perfect the rules. Also matches should be packaged and publicized. China, as a country with great influence in table tennis, should make specific policies to help improve the table tennis development of other countries and areas as well as improving the athletic level of its own, so as to make more people of the world to participate in this sport and finally promote the healthy development of world table tennis.

Keywords: *the ping-pong sport, unbalanced status, solutions*

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EFFECTS OF ORGANIZATION STRATEGIES ON TABLE TENNIS FOR IMPLEMENTING COOPERATION CONTEXT

Abstract

The purpose of the study was to examine the effect of pre-organization and post-organization strategies on table tennis performance and interaction in a cooperative context. Participants were 40 junior high school students, randomly assigned to treatment, stratified for ability. Achievement across the groups was compared using a 2 x 2 factorial design. Between participants factors included grouping with two levels (cooperative learning and individual learning) and types of organization with two levels (pre-organization, and post-organization). The dependent variables were achievement and interaction. Students completed a basic skill of table tennis; the effects of pre-organization and post-organization strategies and cooperative learning were examined across posttest. Interaction behavior was also assessed. Results revealed that students working together (cooperative learning) significantly outscored those working alone (individual). However, in pre-organization group affect achievement compared to post-organization under cooperatively condition did not have a significant effect on achievement. One possible reason for this finding is that lack of effective cooperative learning training to support each other's learning needs. Furthermore, the result revealed that only two interactive behaviors: supporting explanation and demonstration can be used successfully to predict student achievement. Another possible explanation for this result is that low-ability students in heterogeneous groups feel more supported and satisfied than high-ability students. Hence, students with a cooperative context should be given the opportunity to interact with others during the table tennis instructional setting.

Keywords: *organization strategies, cooperative learning; table tennis*

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REVISION OF TWO TEST ITEMS OF THE DUTCH TALENT IDENTIFICATION ASSESSMENT MEASURING BALL CONTROL IN YOUNG ATHLETES - A VALIDITY AND REPRODUCIBILITY STUDY

Abstract

Context: many countries could benefit from an innovative talent developmental program which is based on scientific evidence including appropriate and more objective talent identification. The talent identification assessment of the Netherlands Table Tennis Association includes eight test items to measure general motor traits underlying specific table tennis skills. From an evaluation, two test items, 'aiming at target' and 'ball skills, demonstrated low reproducibility and too little contribution to the total assessment score. Revision of these items was recommended. Therefore, new test protocols were developed and validity and reproducibility of the revised test items were investigated. *Methods:* forty-three youth table-tennis athletes (age 6-13 years) from national (n=16), regional (n=12) and local training-level (n=15) were tested. Two revised test protocols were used. 'Aiming at target': youngsters were instructed to hit a round target on the floor at 2.5 m distance with a table tennis ball using a standard bat. Forehand and backhand need to be used alternately during ten attempts. 'Ball skills': youngsters were instructed to hit a round target on the floor via a vertical positioned table tennis table by throwing a table tennis ball. The athlete stands alternately at a position of 1 and 2 m from the target. In total the athlete has twenty attempts. Athletes from the regional and local training group did a retest at the same day to estimate reproducibility. For validity analyses a one-way ANOVA with Bonferonni post-hoc test was used to test for significant difference between the training groups and a Spearman's correlation was calculated to estimate the association between test results and ranking. Reproducibility analyses included reliability (ICC's) and agreement (SEm, SDD and CV) parameters. *Results:* mean points per training group for 'aiming at target' were 37 (± 8) for the national level, 30 (± 9) for regional level and 22 (± 15) for local level. For 'ball skills' the same tendency was seen in mean points: 20 (± 6) for the national level, 18 (± 6) for regional level and 12 (±7) for local level. Validity analyses showed a significant difference between the national and local training groups for both test items (p<0.05) and moderate significant associations between ranking and the test results of 'aiming at target' (R=-0.583; p<0.001) and 'ball skills' (R=-0.612; p<0.001). ICC's were good for both test items: 'aiming at target' ICC 0.838 (p<0.001) and 'ball skills' ICC=0.894 (p<0.001). CV's were up to 50% of the mean. *Conclusion:* both revised test items are sufficiently valid and reproducible instruments. Implementation in a talent identification assessment for table tennis seems legitimate.

Keywords: *talent identification, reproducibility of results, motor skills assessment*

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RELATIONSHIP AMONG SPORT INVOLVEMENT, FLOW EXPERIENCE AND PERFORMANCE FOR TABLE TENNIS ATHLETES

Abstract

This research was aimed to investigate the relationships among the table tennis players' level of involvement, flow experiences and sport achievement.

Methods: A sample 100 university- table-tennis-teams players, that is a convenient sample, were surveyed with questionnaire. A canonical analysis and multiple regressions were utilized to analyze the data.

Result: it was showed that the higher level of players' importance, satisfaction and "sharing with others", in terms of the level of involvement, the higher of players' sense of competence of flow experiences. The importance of players' involvement and "easy to control" were found to be the key factors of player's achievement. **Conclusion**: there was a significant positive correlation between players' involvement and flow experience. Additionally, these two were found to influence players' achievement which can shed a light in the field.

Keywords: *importance, easy to control sense, performance*

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ANALYSIS OF TRAJECTORIES AND SPEED OF THE BALL IN TABLE TENNIS

Abstract

Introduction

This study constitutes the first part of an ambitious project concerning the analysis of the body movements of the arm for a table tennis player and about the consequence on the trajectory of the ball. The analysis of the trajectory of the ball in table tennis made an object for a few scientific studies. Nevertheless, our works are based on a technical improvement of Alain Durey and Marie-Martine Ramanantsoa study realized in 1989 in the laboratory of Sports Neurosciences in INSEP, Paris.

Method

The analysis of the trajectory of ball may be at first envisaged in two dimensions (2 D) by setting a high speed filming camera (at least 300 images.s^{-1}) perpendicularly to the trajectory of the ball. This measure of the trajectory of the ball requires a calibration of the plan by using the 2D DLT method which consists in positioning four points of calibration in a harmonious way in the plan of theoretical evolution of the ball (2 according to the vertical dimension and 2 in the longitudinal dimension). Specific time derivative algorithms adapted to fast movement are then operated to calculate the evolution of the speed of the ball in two components of the plan. This study of trajectories and speeds of the ball will be led on the various effects produced by a table tennis player of good level. The influence of the effects on the obtained results will be notified and envisaged for the learning of the technical and tactical aspects of the practice.

Afterward, a study in three dimensions (3 D) requiring at least two cameras can be envisaged to exclude the flat hypothesis of the trajectory of ball and to take into account better the engendering rubbed effects which gives more complex trajectories.

Results

The first experiments are in progress in the University (UFR STAPS) of Bordeaux. The conditions of recording as well as that of lighting are in the course of optimization. Afterward, a campaign of measures 2Ds will be led on three table tennis players of departmental, regional and national level producing three types of ball striking to study the influence of the level and the effects on the parameters of trajectory and speed of ball. All the results will be presented during the 13th ITTF Sports Science Congress in Paris.

Keywords: *ball speed, trajectory, high speed camera*

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SPREADING AND PLAYING ABILITY OF DEFENSIVE PLAYERS IN COMPETITIVE TABLE TENNIS

Abstract

The beauty of table tennis lives to a significant extent on matches where skilful offensive and defensive players face each other. In racket sports the term defensive player is rather distinct to table tennis. Throughout the 1930s and 1940s lots of defenders could be seen in competitions but various alterations in the world of table tennis turned to a decline of backspin defence. This study shows that, despite the loss of playing ability, this recession proceeds rather slowly as far as the presence of defensive players on a world class level is concerned. Besides this, it seems obvious that defensive players were not that widespread on a world class level in the recent past as suspected. Moreover, it is shown that the proportion of defensive players across different levels of performance is surprisingly stable which argues for the capability of defensive play. To examine this, three studies were carried out totalling 890 players from world class to leisure sports level. Statistically speaking, there is even a tendency that the proportion of choppers on the highest level is larger than in the categories below. It becomes clear that the number of female choppers among the top 200 of the world is significantly higher than the respective number of male defenders. Finally, the reasons for the decline of defensive play in the world of today are discussed.

Keywords: *defensive player, playing ability, two colour rule, coaching*

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CHANGES IN FIELD TEST PERFORMANCES THROUGHOUT A YEARLONG TRAINING / COMPETITION CYCLE OF YOUNG, HIGHLY TRAINED ARAB TABLE TENNIS PLAYERS

Abstract

Table tennis requires speed, explosive strength and a strong aerobic base. These qualities can be monitored throughout the year by field testing. The purpose of this study was to examine changes in field test performances during the yearly cycle of young, highly trained Arab table tennis players.

Methodology: six players (13.1 ± 1.1 years) training or competing in the national junior squad for approximately 13 hours per week participated in this study. From each field test session [Sep-11 (start of yearly cycle), Dec-11 (post training phase), May-12 (mid competition phase) and Sep-12 (post competition, Ramadan and summer break)] the best performance from two 5 m sprints, three counter-movement jumps (CMJ's) and one test to estimate maximum aerobic speed (MAS) was taken. Between session (paired) standardized differences (Cohen's effect size, ES) were calculated. To account for any growth related effect on performance, all between test comparisons were adjusted for changes in body mass. The changes were then assessed qualitatively (e.g., unclear, likely [1]) using the estimated smallest worthwhile change and the 90% confidence interval associated with each ES.

Results: table 1: 5 m sprint time, CMJ height and MAS (mean ± SD) for 6 highly trained Arab table tennis players tested throughout a yearlong training / competition cycle.

	SPEED - 5 m sprint time (s)				EXPLOSIVE STRENGTH - CMJ (cm)				AEROBIC FITNESS - MAS (km/h)			
	Sep-11	Dec-11	May-12	Sep-12	Sep-11	Dec-11	May-12	Sep-12	Sep-11	Dec-11	May-12	Sep-12
Mean ± SD	1.18 ± 0.12	1.16 ± 0.09	1.15 ± 0.08	1.12 ± 0.09	27.27 ± 6.06	30.65 ± 8.61	31.35 ± 7.29	32.38 ± 8.18	13.17 ± 1.56	13.40 ± 1.52	14.11 ± 1.78	14.08 ± 1.33
ES differences												
Sep-11		-0.19 unclear	-0.25 unclear	-0.45 likely		0.47 likely	0.57 very likely	0.71 very likely		0.12 unclear	0.50 likely	0.49 likely
Dec-11			-0.08 unclear	-0.33 unclear			0.07 unclear	0.17 unclear			0.15 unclear	0.36 unclear
May-12				-0.31 unclear				0.12 unclear				-0.01 unclear
Body mass (kg)	51.5 ± 12.1	54.9 ± 11.5	56.0 ± 10.9	59.8 ± 10.7								

Discussion: between Sep-11 and Dec-11 there was only likely to be an improvement in explosive strength. From Dec-11 to May-12 improvements in speed, explosive strength and aerobic fitness are unclear and may have been hampered by the need to focus on the technical and tactical components of competition. However, very likely and likely improvements in explosive strength and aerobic fitness respectively occurred between Sep-11 and May-12 probably due to the accumulative effect of physical conditioning work done since the start of the year. The lack of progression from May-12 to Sep-12 in all physical qualities could be attributed to a period of detraining over the summer break.

Conclusion: over the course of a year, these young table tennis players have likely developed their speed, explosive strength and aerobic fitness, independently of changes in body dimension. Additional, targeted conditioning work between May and Sep in particular should enable young, highly trained Arab table tennis players to start the next yearly cycle in improved physical condition.

Keywords: *field test, yearly cycle, table tennis*

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MARKETING STRATEGIES OF BUILDING TABLE TENNIS PADDLES' BRAND IMAGE

Abstract

The table tennis paddle is carries on the pool movement the necessary tool, but promotes unceasingly along with the technology. In the market condition the table tennis paddle's brand is multitudinous, causes the common consumer to meet did't know how to choose, but how does brand show they characteristic, the promotion brand image and conforms to the consumer demand to attract consumer's vision, is the marketing important key. Therefore, this article penetrated the literature discussion, induced the brand image establishment the importance as well as its strategy which sells to the table tennis paddle, by as well as would be ordinary as the movement correlation industry marketing the populace to select and purchase the reference in the future. Result indicated that: first, the brand image may enhance to the product quality cognition and changes the negative image. Also, the brand image is better, the consumer is higher to the product cognition quality, more can promote the consumer loyalty effectively. Second, the brand image height truly has the positive influence to the consumer product quality consciousness. Third, marketing strategy the brand image may because of model sets up the unique brand characteristic and because of the support promotion well-known and the promotion product value, lets the consumer have by chance, the interest and the sympathy, then promotion purchase motive. Fourth, the brand image sells speaking of the enterprise is a very important key aspect, conducive toward favor promotes consumer's purchase wish, must unify the various marketing strategy; if (1) supports the athletes; (2) brand movement correlation; (3) media marketing conducts this brand correlation; (4) utilizes the SWOT analysis; (5) marketing strategy combination.

Keywords: *table tennis paddle, brand image, marketing strategies*

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RESEARCH IN THE THREE DIMENSIONAL ANALYSIS OF A FOREHAND STROKE

Abstract

Table tennis is a game which loses a score, when the struck-back hit ball does not bound on a partner coat. The game characteristic asks a player for control and power of a hit ball. The important points which raise control and power are the height of reproducibility of motion and an efficient stroke.

Analysis of a complicated motion of the player in a game is impossible. Then the motion of a player when hitting the ball which moves to right and left regularly was analyzed.

Subjects are five college student boy players which participated in the all Japan championship.

Motion analysis was conducted with the optical real-time three dimensional analysis system (SMART-D). After recording using an infrared reflective marker system with eight cameras, displacement, speed, acceleration, an angle, and angular velocity were analyzed by software (SMART Analyzer).

Firstly, reproducibility of motion was analyzed as evaluation of control. The motion of a subject's parts of the body has overlapped mostly, and it was checked that the reproducibility of a motion is very high. The variation pattern of the center of gravity has also overlapped mostly, and it was checked that the reproducibility is also very high.

Secondly, the twist of the waist was analyzed as evaluation of power. The variation pattern of the angle beta (to the upper part) which the line segment which connects the both shoulders and both the waists of a player makes became large on the occasion of the backswing. And, beta was small towards impact and the forward swing following the next. It was checked that the fastest person of ball speed is fully twisting the waist before and after impact.

Fully twisting the waist when performing a hit ball concluded that it contributed to increase the ball speed.

Keywords: *three dimensional analysis, table tennis, forehand, footwork, reproducibility, twist of the waist*

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OFFENSE-DEFENSE MODE ANALYSIS OF THE WORLD TOP MALE TABLE TENNIS PLAYER. A CASE STUDY BY CHUANG CHIH-YUAN WHO PARTICIPATED IN 2012 LONDON OLYMPIC MALE SINGLE GAMES

Abstract

The purpose of this study was to explore the world top male table tennis player, Chuang Chih-Yuan taking the successful offense-defense mode to win 2012 London Olympic Games and get ranked fourth, which was his best performance than Taiwan's male athletes over years to participate in Olympic Games. He is currently the most outstanding Taiwan's male table tennis player, so we not only selected him as the research object but also choose from his five matches as the study scope and took three-staged techniques analysis method of table tennis as the study structure. And then, to respectively analyze how to take advantage of offensive and defensive tactics of serve-then-attack part (S.T.A.P), receive-then-attack part (R.T.A.P) and rally part (R.P) to play every round. Finally, we summarize and get the results to be as a reference to training Taiwan's young players in the future from his successful mode, the study found as follows:

(1). In the first three matches (Third Round, Fourth Round, Quarter finals) of S.T.A.P, R.T.A.P and R.P were better than the opponent, but in the last two matches (Semifinals, Bronze Medal Match), only his S.T.A.P was a bit of better than the opponent, so the main causes to be defeated in the match were the obvious disadvantage of his R.T.A.P and R.P.

(2). There were 4 kinds of score modes in his S.T.A.P including the best mode was "serve near net / attack / counter-driver"; there were 13 kinds of score mode in his R.T.A.P including the best mode of direct scoring by "backhand sidespin flick" and there were the 11 kinds of score modes in his R.P including the best mode was "counter-driver / counter-driver / counter-driver".

(3). There were 6 lost points mode in his S.T.A.P, mainly lost points mode was "serve near net / attack / counter-driver"; there were 13 lost points mode in his R.T.A.P, mode of the major loss of points was "control / attack / defense"; there were 13 lost points mode in his R.P, mainly lose points mode was "counter-driver / counter-driver / counter-driver".

Keywords: *table tennis, three-staged techniques, technique and tactics*
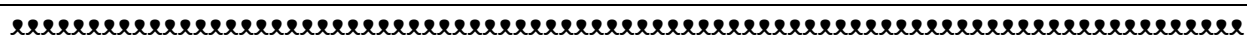
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A STUDY OF JUNIOR HIGH SCHOOL STUDENTS' INVOLVEMENT OF THE TABLE TENNIS COURSE AND COGNITION OF LEISURE BENEFITS IN KAOHSIUNG CITY

Abstract

This study aimed to analyze the different backgrounds of the junior high school students on the table tennis course involvement and the perception of leisure benefits in Kaohsiung. The "table tennis involvement and leisure benefits cognition questionnaire" was used in this study. The subject was junior high school students in Kaohsiung city. According to the results, hotelling trace, single-factor multivariate analysis of variance statistical method was used in data analysis. The results were summarized as follows: (1) grades and participating table tennis club were significant differences with involvement of the table tennis course in Kaohsiung City junior high school students. However, there was no significant difference between gender and involvement of the table tennis course in Kaohsiung City junior high school students. (2) Grades and participating table tennis club were significant differences with the cognition of leisure benefits in Kaohsiung City junior high school students. However, gender was no a significant difference with the cognition of leisure benefits of Kaohsiung City junior high school students. Suggestions: (1) there was a need to promote benefits of table tennis participation. (2) Different grades and whether or not participating table tennis club need to have different strategies to increase students' involvement and cognition of table tennis.

Keywords: *table tennis, involvement, cognition of leisure benefits*

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A STUDY OF CORPORATE SPONSORSHIP IN TAIWAN TABLE TENNIS TEAMS

Abstract

Corporate sponsorship is currently one of the fastest growing forms of marketing communication. Corporation is hoping to achieve goals through sponsorship. Without corporate sponsorship, sport teams are very difficult to survive. Therefore, corporate sponsorship is very important to develop in the sport field. However, corporate sponsorship was decreased and it caused diminish to cultivate professional athletes in Taiwan. It is needed for table tennis field to concern this issue in order to increase willingness to sponsor table tennis team and achieve win-win situation for corporations and table tennis teams. Therefore, the purpose of this study was to explore the situation of corporate sponsorship in Taiwan table tennis teams. An in-depth interview was used for this study to collect data. Relevant documents were used as data which was corporate website, internet, newspaper and handout information from representative of corporation. Content analysis used to analyze data. The interview subjects were head coach of the table tennis team which was used corporate name to participate competition and who were in charge on sport sponsorship. The result indicated that: (1) goals of sponsorship were contribution to society, cultivation of table tennis players, building positive image and development of table tennis environment. (2) Factors of corporate sponsorship were brand image, exposure, public welfare, and marketing promotion. (3) Prevention factors of corporate sponsorship were budget, corporative leader's favorite, effectiveness of corporate sponsorship and shareholder's willingness. Suggestions of this study were as follow: (1) table tennis teams should manage the team actively in order to attract interesting of corporate sponsorship. (2) Table tennis teams need to provide and cooperate with corporate marketing promotion in order to increase sponsorship effectiveness. (3) Table tennis teams should communicate with sponsors in order to impetus and promote willingness of sponsorship.

Keywords: *corporate sponsorship, sport sponsorship, table tennis*

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THE IMPACT OF COOPERATIVE LEARNING AND MOTIVATION ON TABLE TENNIS DURING PERFORMANCE AND SATISFACTION

Abstract

The purpose of this study was to investigate the effect of cooperative learning and the motivation on performance and satisfaction from a table tennis teaching perspective. Participants used either a cooperative or individual learning strategy while receiving instructional information, and feedback from an instructional table tennis lesson. This lesson is designed for self-instruction and group learning. The content consists of four segments: 1) Basic-stroke analysis. 2) Full stroke analysis. 3) Dynamic features analysis. 4) Drill setting. After receiving specific directions for implementing individual versus cooperative strategies, 60 university students, classified as high and low need motivation for affiliation, were randomly assigned to treatments. Participants were randomly assigned to one of two treatment conditions, one which required subjects to work individually during the lesson and one which required subjects to work in triads. Students completed a basic table tennis lesson; the effects of cooperative learning and the need motivation for affiliation were examined across posttest. Satisfaction was also assessed. Results revealed that students in the low motivation need for affiliation treatment outperforming those in the high motivation need for affiliation treatment. However, the result did not reveal a significant main effect for instructional method. This finding does not appear to supports the large body of literature from motor skill instruction and traditional learning environments that cooperative learning is superior to individual conditions. Furthermore, the result revealed a significant interaction between instructional method and the motivation need for affiliation, and a significant main effect for instructional method. These data suggest that participants who worked cooperatively reported greater overall satisfaction with the instruction than those who worked individually.

Keywords: *motivation, cooperative learning, table tennis*

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EFFECT ANALYSIS ON BACKHAND SIDE-TWISTED TECHNIQUE IN RECEIVING USED BY OLYMPIC WINNER ZHANG JIKE

Abstract

Introduction: Chinese player, Zhang Jike has successively won the table tennis championships of the World Championships, the World Cup and the London Olympic Games within a year and a half. During these games, his backhand side-twisted technique in receiving on right 2/3 table is prominently used in the competition. The effect of this technique is analyzed in detail in this research.

Method: this research selects 5 table tennis singles matches participated in by Zhang Jike in London Olympic Games 2012, through calculating the scoring rate, usage rate and success rate of the forehand loop / flip and the backhand side-twisted in receiving, to analyze the effect:

Scoring rate = (scoring of forehand or backhand technique / total number in receiving) × 100%

Usage rate = (usage count of forehand or backhand technique / total number in receiving) ×100%

Success rate= (success count of forehand or backhand technique / usage count of forehand or backhand technique) ×100%

Results and analysis:

3.1 When receiving, Zhang Jike adopts his backhand side-twisted technique on the right 2/3 table frequently, and the success rate of backhand side-twisted technique is higher than that of the forehand loop/flip; the success rate of his backhand side-twisted in receiving is 84% and that of his forehand loop/flip is only 49%.

3.2 The mean value of scoring rate of backhand side-twisted in receiving on the right 2/3 table is 14%, and that of usage rate is 51%; the mean value of scoring rate of forehand loop/flip is 3%, and that of usage rate is 10%.

3.3 The effect of connection of backhand side-twisted in receiving on the right 2/3 table with the forth stroke shows that there is only 42% of active attacking for the fourth hitting and 58% of passivity for the forth stroke. The reason mainly lies in the fault of position after his backhand side-twisted in receiving.

3.4 The ball placement of the backhand side-twisted technique in receiving on the right 2/3 table by Zhang Jike is mainly the middle of his opponent (usage rate 68%), secondly being the backhand side (usage rate 21%), thirdly the forehand side (usage rate 11%).

Conclusions: the backhand side-twisted technique in receiving on the right 2/3 table adopted by Zhang Jike is higher stability and easier scoring in comparison with the forehand loop/flip. But the fault of stroke position after the backhand side-twisted in receiving may often cause passive effects.

Keywords: *backhand side-twisted, receive, effective analysis*

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A PERFORMANCE ANALYSIS OF OLYMPIC CHAMPIONS IN TABLE TENNIS

Abstract

Introduction: various performance analyses have been conducted in table tennis games. Some of method has been proposed. However, there is little research which analyzed the elite player's statistic. Understanding characteristics of an elite player's performance make it possible to carry out effective practice for coach and young players. The purpose of this study was to clarify characteristics of the top player's performance.

Method: the study was targeted at Zhang Jike and Li Xiaoxia, top players of the world ranking. The data collection of the study was across the singles matches during the 2012 London Olympic Games. Zhang Jike participated in 5 singles and 4 team matches. Li Xiaoxia participated in 5 singles and 3 team matches. First we counted the number of shots (service is 1st, service receive is 2nd, and the next is 3rd) in a rally, points won on own serve and points won on own receive. Next we analyzed the choice of racket face used (when serving and returning), type of strokes, the path, and the height of a ball.

Results: Table 1 Zhang Jike's points won on own serve and points won on own receive in 9 matches.

	Opponent	nR	%W	%SW	%RW	St/W	%SA
MS Round of 32	VANG Bora	72	61(44/72)	70(26/37)	51(18/35)	3.05 (134/44)	18(7/37)
MS Round of 16	SAMSONOV Vladimir	123	52(64/123)	62(38/61)	41(26/62)	4.69 (300/64)	8(5/61)
MS Quarter Final	JIANG Tianyi	86	60(52/86)	68(30/44)	52(22/42)	3.81 (198/52)	18(8/44)
MS Semi Final	OVTCHAROV Dimitrij	88	55(49/88)	59(26/44)	52(23/44)	3.18 (156/49)	13(6/44)
MS Final	WANG Hao	113	55(63/113)	56(32/57)	55(31/56)	4.00 (252/63)	12(7/57)
MTS Round of 16	SKACHKOV Kirill	56	60(34/56)	48(14/29)	74(20/27)	3.65 (124/34)	13(4/29)
MTS Round of 16	SMIRNOV Alexey	55	60(33/55)	57(16/28)	62(17/27)	2.91 (96/33)	17(5/28)
MTS Semi Final	BOLL Timo	77	46(36/77)	50(19/38)	43(17/39)	3.19 (115/36)	7(3/38)
MTS Final	JOO Saehyuk	72	52(38/72)	47(17/36)	58(21/36)	7.03 (267/38)	0(0/36)

nR: total number of a rally; %W: points won average; %SW: points won on own serve rally; %RW: points won on receive rally; St/W: the average strokes of points won; %SA: points won on an ace.

Fig. 1 Zhang Jike's points won of the number of a shot in a rally in 9 matches.
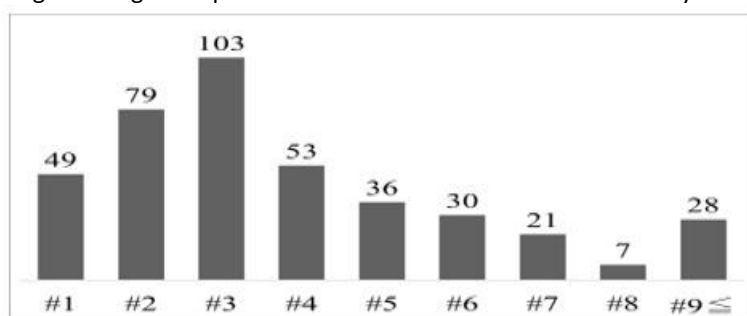
Keywords: *table tennis, performance analysis, elite player*

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A STUDY ON QUANTIZING 'HIGH LEVEL' TABLE TENNIS FOR ROBOT TRAINING IN INDIA

Abstract

Table tennis being a very popular sport, hence the scope of '*high level table tennis*' is often subjective to the scale of athlete's participation under discussion. The scope can range from hobby, school, club, district level and so on until as highest as world level. It is a proven that simulated training enhances the athlete's performance [4]. In India, currently there are very few high level players and coaches. In order to have more high level players and coaches, be enabled and compete with other elite players at world level simulated training with automation is a key factor. The aim of this study is to quantize 'high level table tennis' by which the different aspects of table tennis is broken down into measurable components, like the service technique analysis[1], ball fall point analysis [2] and collect data. The data is then analyzed and processed to convert them into procedures or inputs that can be used for organized robot training. The robot training can be further extended to match simulations, opponent specific trainings and even to create virtual opponents. The null hypothesis of the study is that by implementing the statistics and simulation based robot training the athlete's performance is enhanced manifold and it assists the coaches to prepare athletes for the next level. Method: 1. Survey on effectiveness of robot training, from a sample of coaches in India, feedback on capabilities and limitations of any specific table tennis robot. 2. Collect athlete specific quantized data (sample from club level onwards) during a state championship tournament or practice sessions. 3. Prepare robot training based on collected data and implement training schedule for sample athletes. 4. Verify enhancement to athlete performance and skill as defined in [3]. 5. Validation of null hypothesis defined for the study or justify the observation based on the study.

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Keywords: robot *training, table tennis, coaching, simulated training*

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ANALYSIS OF THE PRINCIPLE AND TECHNOLOGY OF LOOP DRIVE

Abstract

Most researches on loop drive, both at home and abroad, focus on the description of the flying trajectory of ping pang ball off from bat. No comprehensive analysis on loop drive is found in the field of tribology and mechanics. This essay try applying these theories to do some research on loop drive combined with bat exploration. In brief, a integral loop drive consists of four movement stages and five of friction pairs: the first stage is to swing the bat with its plane for- and downward, colliding with the ball's edge in a small angle. During the process, a slanting elastic concave-convex space deformation of the inverted rubber turns impact energy into relative tangential motion. Meanwhile a frictional normal load is produced, accompanying with an elastic rolling normal surface structure, which frictionally carries and rebounces the ball flying off the bat with strong top-spin. We call this process 'tangential hit'. The second stage is the ball's flying in the air along a banana-ball trajectory because of air friction. The third one is the collision process between the ball and the table, accompanied with a slant-concave deformation and a rolling over the table, then the ball is tossed out off the table in a decreasing angle with a little bit oscillation in an irregular pattern. The last one is a banana-ball track again. This essay presents analysis in detail, finds some new characteristics, sets up the theory on loop drive-'tangential hit', and renames 'Huquanqiu' to 'Huxuanqiu' in Chinese.

To produce high quality loop drive, strong hip body strength and fast arm strength must be superposed to form a powerful resultant force by which a stable and strong swing of bat can be formed and then tangentially hit the speed coming ball with back spinning push track in the overlapping space in which maximum frictional normal load and the highest speed of bat can be reached.

The detailed analysis in this paper can help players and coaches to have a comprehensive understanding on loop drive, to improve the training techniques and quality, to increase the possibility of success to score.
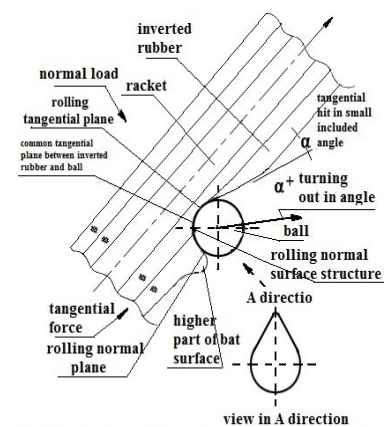
Schematic diagram of loop drive

Keywords: *tangential hit, slanting rolling, concave-convex deformation, frictional carry, banana-ball trajectory, abnormal trajectory*

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EFFECT OF DIFFERENT PLAYING SURFACES OF THE TABLE ON BALL BOUNCES IN TABLE TENNIS

Abstract

It was showed on the questionnaire survey that players think that performance will also change, when the table tennis table to be used changes. The purpose of this study was to measured coefficient of friction (CoF), resilience and ball spin before and after bounced of used table tennis tables in Japan. These were measured pair three domestic manufactures the tables（Co.A, Co.B, Co.C）with the balls（Co.B, Co.C, Co.D）in two ways. The CoF between the playing surface and the ball were greatly affected by different manufacturer pairing the table with the ball（Fig.1）. The CoF between the playing surface of any table and the ball of Co.C was the smallest. The friction was produced to reverse direction when the topspin ball rotation before bounces measured 3000 rpm or more. The resilience of playing surface of the Co.C table was lower than other tables in both topspin and backspin. The greatest CoF of playing surface in backspin was Co.A, followed by Co.C and Co.B in this order. It was important for raising the player's performance to understand the characteristic of both spin and trajectory by the table different in character of playing surface.
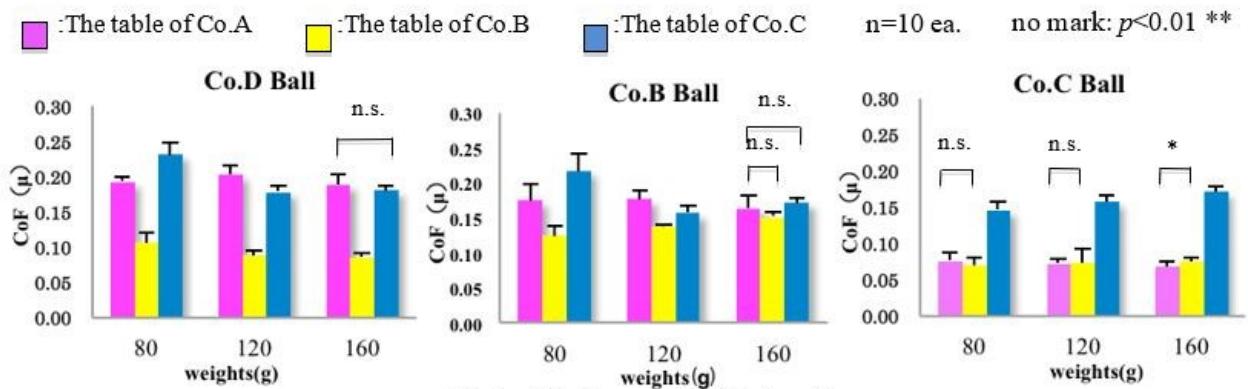
Fig.1   The dynamic CoF by traction

Keywords: *playing surface, coefficient of friction, resilience, ball spin*

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THE INTERACTION BETWEEN SERVES AND MATCH WINNING IN TABLE TENNIS PLAYERS IN THE LONDON 2012 OLYMPIC GAMES

28

Abstract

Serves and returns are some of the main points in the playing performance in racket sports. This happens because the serve is a unique shot which is closely related to the player's technical and tactical strategy. The aim of this study was the assessment of the interaction between the serves and the match winning in world-class table tennis players. The studied sample consisted of 16 male and 16 female players who participated in the top-16 round in the London 2012 Olympic Games single tournament. The evaluated parameters of the matches were: the game played, the game win, the win points from serves, the points lost from serves, the opponent win points from the serves and the opponent losing points from serves. The analysed data of the London 2012 Olympic Games table tennis tournament was derived from the official results presented by the IOC. The data normality was checked by using the Van der Waerden's method, while the variables' normal distributions were confirmed by the probability P-P plots. The Chi square (χ^2) was firstly generated to analyze the mean top-16 matches data relative to the gender.The factor analysis assessed the possible advantage of the serves win points during the match, while the Pearson's analysis was applied for the evaluation of the inter-correlation among the playing parameters. All statistical analyses were carried out by employing the SPSS-PASW 18.0 for Windows. From the results it is shown that the evaluated matches' parameters of the players who participated in the London 2012 Olympic Games did not differ in relation to the gender. The Pearson's coefficient presented that the earned points from the serves were significantly correlated with the overall playing performance in both male (r=0.98, p<0.001) and female (r=0.96, p<0.001) world-class table tennis players. Furthermore, the principal component analysis reported that the players who won points from the serves will win more games. Thus, the factor analysis confirmed that, with an accuracy of 93% to 94% in male and female world-class players, the successful serves lead to the win of the match regardless the number of the played games. In addition, the qualitative analysis of the winning points when the players served ranged between 62 % and 67% in both men and women medal winners during the single tournaments of the London 2012 Olympic Games. In conclusion, the winning outcome in table tennis matches is strongly related to the successful serves of the world-class players. The findings of this study, which presented the serves advantage in the playing performance, could be valuable for the table tennis players' training orientation.

Keywords: *reaction speed, serve, technique, performance*

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DISTINCTION BETWEEN THE ROLE OF A PLAYER AND THE ROLE OF A COACH BASED ON DIFFERENT MEMORY TYPES

Abstract

There is no doubt that table tennis can benefit significantly from other disciplines, such as neuroscience. For instance, the findings on different types of human memories (e.g., short-term memory and long-term memory) in neuroscience can provide a valuable insight into some important areas of table tennis. This paper presents how a correct and optimal use of different types of memories can bring out the best in not only the players but also in the coaches of the sport. The proposal of this paper may be summarized under two aspects. First, different types of memories can be powerful means of describing a table tennis player's learning process, thus contributing to the advancement in player training programs. Second, the correct understanding of different memory types leads to the distinction between the role of a player and that of a coach and subsequently to the requirement of formal coaching education for coaches, which affirms the value of the present ITTF formal coaching education programs. It is often the case that many former players remain in the sport by taking on the duties of coaching. While it is an understandable and commendable choice, it should be noted that it is crucial for the success of the coach with this player-centric background to acknowledge the distinct role of a coach, which is significantly different from that of a player, and receive proper training.

Among the vast amount of neuroscience literature, this paper will mainly draw on the findings introduced in *Choke: What the Secrets of the Brain Reveal About Getting It Right When You Have To* (2011) by a Chicago University neuroscientist Sian Beilock. Based on Beilock's classification of different types of memory (working memory, procedural memory, and explicit memory), this paper shows that different memories are at work among the players according to their developmental stages as well as between players and coaches. The other main publication that will be used to document a system of thought on the principles of table tennis play is *PATT – A Principles Approach to Table Tennis: A foundation for exceptional play* (Olsen and Kim, 2009). The contribution of this paper is that it provides a refreshing and useful insight into table tennis coaching, in the area of player training and coaching by showing the involvement of different types of memories in a coach's and a player's performance.

Keywords: *memories, neuroscience, Beilock, PATT*

☙☙

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A STUDY OF SPONSORSHIP STRATEGIES OF WORLD TABLE TENNIS CHAMPIONSHIP

Abstract

The sponsorship from businesses is the key to make the sport events success. The world table tennis championship is one of the most important international tournaments so it is essential to attract corporate to sponsor the tournament. Therefore, the purpose of this study was to understand the principles and strategies of sport event sponsorship in order to provide reference to the world table tennis championship planning corporate sponsorship. The study used literature review to collect information. From the literature review, the study was concluded: (1) dividing levels of corporate sponsorship such as title sponsor, presenting sponsor, financial sponsor and official supplier; (2) building long-term sponsorship to set up the cooperation with the business to enhance the win-win effects; (3) correlating with the spirit of the tournament: fascinate more corporations which were relative with the spirit of the tournament to involve in; (4) attracting global corporations to sponsor; (5) using leverage strategies such as public relations, internet, using visual system, broadcast media, interact with costumer, sales of products, authorized products, and special treatments. Suggestions of the study were as follow: (1) constructing the levels of the sponsorship for the table tennis tournaments; (2) providing the long term corporate sponsor opportunities; (3) looking for corporations correlate with the spirit of the tournament; (4) manipulate the leverage strategies to draw more global corporations in the table tennis sponsors.

Keywords: *corporate sport sponsorship, sponsorship strategies, world table tennis championship*

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A STUDY ON RESOURCE ALLOCATION OF TABLE TENNIS FACILITY

Abstract

This research was designed to discuss the differences of students' perceptions before and after they use table tennis facilities and service quality. These students were taking the physical class at the time. The study was also aimed to investigate the pros and cons of the present table tennis facilities. Furthermore, it was hoped to detect the possible flaw in terms of resource allocation and explore the possible improvements. A questionnaire with a total number of 20 questions which included several attributes, such as, sports facilities, courts planning, and service was utilized in the research. 249 students who took the course participated in the date collection. A paired t-test analysis was used to find the difference perception before and after they experience the facilities. Additionally, An Importance-Performance Analysis (IPA) grid was used to investigate the key factors of the possible resource allocation problems. The IPA was divided into four categories," Keep up the good work", "Possible overkill", "Possible overkill", and "Concentrate here". The results indicate that there were eight items at "Keep up the good work" grid; four items fell at "Possible overkill" grid; three items located at "Low priority" grid, and five items fell at "Concentrate here" grid. Especially, the items in "Concentrate here" grid included, "the length of time for repairing failure facilities", "the accessibility for the disabled, and "the air quality of table tennis courts". The result may show the priority issues that need to be addressed in improve the sports facilities. The outcomes of research may serve as guidelines in sports facilities management and policy making. The application of the results was hopped to increase the satisfaction of the table-tennis facilities effectively and students' motivation of participating in table tennis, in turns, to develop students' sporting habit for life.

Keywords: *importance-performance analysis, resources allocation, sports facilities*

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COMPETITIVE READINESS SCALE FOR TABLE TENNIS ATHLETES (CRSTTA)

Abstract

Competition normally brings about pressure that affects the performance of the athlete. Hence, every player should be prepared before going into competition. Such preparation defines how well the athlete is ready to compete which determine his/her success. In the Philippines, there is a dearth of instruments to measure how well an athlete is ready and prepared to go into competition where he is expected to win. Thus, the thrust of this study is to create a valid and reliable instrument to assess competitive readiness of a player particularly a table tennis athlete. This test development utilized test construction methodology to arrive at its objective in coming up with the CRSTTA (competitive readiness scale for table tennis athletes). In the item generation stage, a multisource approach were collected from existing literatures in sport psychology, physiology, coaching, and focused group discussion with table tennis athletes, coaches, and sport psychologists. This procedure resulted to an initial draft of the test's content domain which is 75 items. These items were generated according to the concepts of mental toughness, coachability, physical readiness, tactical readiness, concentration, anxiety, self confidence, motivation, and team sociability. In the face and expert validation stage, the draft was presented to 5 experts (2 sport psychologists, 2 table tennis coaches, and 1 test construction expert). This procedure resulted to a test draft with 60 items. Scaling of the items were done through a 4-point modified Likert scale where the athlete answers the test with the following: (4) SA-strongly agree, (3) D-disagree, (2) A-agree, (1) SD-strongly disagree. Finally, the test will determine whether the table tennis athlete will be high competitively ready, moderate competitively ready or low competitively ready.

Keywords: *sport psychology, competitive scale, test development*

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NON-VERBAL BEHAVIORS-PERFORMANCE RELATIONSHIP AMONG A SAMPLE OF INTERNATIONAL TABLE TENNIS PLAYERS

Abstract

The main aim of this study was to examine the relationship between non-verbal behaviors of high level table tennis players and their performance during high-stakes table tennis matches. This study also provided descriptive evidence relating to the nature and frequency of the non-verbal-behaviors expressed by athletes while competing. Eight high-level matches from the European Top 12 and French pro A championship for a total of 13 different players ranking 10th-161st on the world ITTF ranking at the moment of the study were analyzed (i.e., one player was analyzed twice and one player was analyzed thrice). Coding grid allowed researcher to extract the following quantitative variables from the videotapes of high-stakes table-tennis matches: (1) nature of non-verbal behaviors deployed by table-tennis players during competition, (2) frequency of non-verbal behaviors deployed by table-tennis players during competition, (3) gain *vs.* loss of match, (4) gain *vs.* loss of game, (5) gain *vs.* loss of the previous point, and (6) gain *vs.* loss of the next point. Quantitative analyses of the videotapes revealed the presence of 25 specific non-verbal behaviors, for a total of 4972 non-verbal behaviors observed during the matches. Results showed that the frequency of non-verbal behaviors was significantly different between: (1) matches win *vs.* lost, (2) games win *vs.* lost, (3) previous points win *vs.* lost, and (4) next points win *vs.* lost. Particular non-verbal behaviors seem thus to have a causal influence on the result of the next point (win *vs.* lost). Specifically, players who "run around the game area" would increase their chances of win the next point. Contrary, players who "remake the gesture" and/or "touch/scratch his face" would decrease their chances of win the next point. The predominant focus in sport psychology has been on pre-performance non-verbal behaviors, with far less attention paid to the non-verbal-behaviors expressed by athletes during competition. Support was provided for the usefulness to examine the wide range of non-verbal behaviors expressed by international table tennis players during the competition as well as for their significant influence on the performance of players while competing.

Keywords: *international table-tennis players, non-verbal behavior, performance*

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THE EFFECTS OF INSOLES IN TABLE TENNIS

Abstract

Numerous injuries in table tennis are in relation to the fact that we still don't have established standards when it comes to sport shoes. According to our own observations and with the help of the latest technology, using knowlege, testings were performed on active table tennis players of both sexes.

Usage of orthokinetic insoles were conducted in two directions from ideal to individual variants.

By latest technology as well as authors modification of standard insoles, an adaptable form was created that enables relaxation of Achilles tendon by moving the center of gravity forward and thus reducing the foot burden.

The positive effects were achieved in 30-50% of all players included in analysis which was proved by comparative static and dynamic measurements.

Keywords: *table tennis, foot, injury prevention, motor skills*

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BIOMECHANICS OF THE STANDARD TABLE TENNIS FOREHAND DRIVE USING A LOW COST MOTION CAPTURE SOFTWARE

Abstract

The study compares the biomechanics of the standard forehand drive of a beginner and an advanced player through a low-cost motion capture software that we have developed. The vertical and horizontal displacements of the three key points: wrist, elbow, and shoulder were analyzed from the video footage of the players. Results show that the technique of the beginner is different from the advanced player with the power of the beginner's stroke coming from the arms instead of the body. The novice player also lacks the follow through and the correct stance of an advanced player.
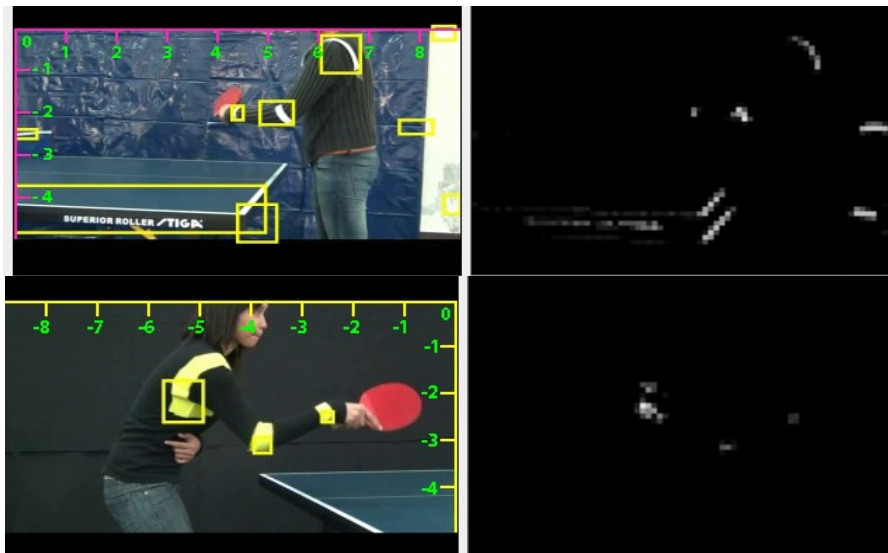
Keywords: *low cost motion capture software, biomechanics*

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TECHNICAL AND TACTICAL PERFORMANCE OF TOP-CLASS SENIOR, JUNIOR AND CADET TABLE TENNIS PLAYERS

Abstract

Introduction. In the recent sports science literature, research branches related to performance analysis are widely developing. The aim of this study was to analyze technical and tactical differences among male table tennis athletes of three categories: top-class world players (T), elite European juniors (J) and elite European cadets (C).

Methods. 20 matches were randomly selected (T:10, J:5 and C:5). Performance indicators were: stroke type, footwork type, and shot outcome. Selected matches have been watched at slow motion (0.2X) by an experienced table tennis coach, who collected the indicators of interest. The data were analyzed with the Excel Software using contingency tables.

Results. On the whole, the strokes most used by all the three groups are the top spin (T:25%, J:27% and C:27%) and the serve (T:19%, J:20% and C:20%). Considering the forehand/backhand execution, top-level players mostly execute the top forehand (19%), top counter top forehand (16%) and block backhand (14%). A similar behavior is observed for juniors: top forehand (21%), top counter top forehand (15%) and block backhand (15%). Conversely, cadets show the top forehand as the most used stroke (22%), followed however by the push forehand (16%). Concerning the footwork type, the most used one is the one step (T:32%, J:28% and C:31%). Differences among groups are noticed for the other footwork types: chassé (T:24%, J:15% and C:15%), and stroke without step (T:18%, J:29% and C:28%). Regarding the stroke/footwork association, the one step is mostly followed by the push forehand (T:39%, J:50% and C:49%), whereas the chassé is followed by: block backhand (T: 26%), top forehand (J and C: 28%). The stroke without step is more frequently linked to the block backhand (T:37%, J:33% and C: 30%). The most successful stroke types were the top forehand (T, J and C:31% of winners) and top counter top forehand (T:26%, J:19% and C: 26%). The main difference between groups is about winning block backhand (T:7%, J:15% and C: 13%). The stroke involving the highest number of errors is the top counter top forehand (T:21%, J:23% and C: 20%).

Discussion. By studying the relationship between strokes, footwork types and shot outcomes in table tennis athletes of three different categories, it is possible to detect differences in the play style among the three categories of players. This can help to improve the technical and the tactical skills of players to obtain better competitive results.

Keywords: *performance analysis, table tennis, footwork technique, shot outcome*

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A CLUSTER ANALYSIS OF COPING AMONG YOUTH TABLE TENNIS PLAYERS: RELATIONSHIP WITH STRESS, RECOVERY, AND BURNOUT

Abstract

This study aimed at examining the ways in which different youth table tennis players may combine the use of several coping strategies and at testing whether stress, recovery, and burnout differ across distinctive profiles of coping. The sample consisted of 159 youth French table tennis players (M = 14.07 years old, SD = 2.07) in intensive training settings ($M_{hours\ of\ training\ per\ week}$ = 15.04, SD = 5.78). These athletes completed the French version of the Coping Inventory for Competitive Sport (CICS; Gaudreau and Blondin, 2002), the French version of the REcovery Stress Questionnaire for athletes (RESTQ-Sport; Martinent and Decret, 2011) and the French version of the Athlete Burnout Questionnaire (ABQ; Isoard-Gautheur, Oger, Guillet, and Martin-Krumm, 2010) between 2 to 5 times with delay of one month between each completion, resulting in 694 subjects. The results of hierarchical (Ward's method) and nonhierarchical (k means) cluster analyses indicated that athletes could be classified in four groups according to their use of coping strategies. Results of MANOVAs revealed that stress, recovery and burnout significantly differed across the coping profiles. Overall, these findings suggested that research should move from coping strategies to coping profiles in order to provide a deeper understanding of how different athletes cope with stress.

Keywords: *youth table tennis players, coping, stress, recovery, burnout, cluster analysis*

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TOP ATHLETES HANDEDNESS IN THE MAJOR RACKET SPORTS

Abstract

Introduction. Previous researches showed a higher percentage of left-hander athletes, compared to the general population, in interactive and fast ball sports (Wood and Aggleton, 1989; Groius et al., 2000).

The aim of this study is to analyze the patterns of representation of left-handedness in top level competitors of the major racket sports.

Methods. The hand used to hold the racket by the 100 world best men's players (selected from 2012 ranks) in tennis (T), table tennis (TT), badminton (B) and squash (S) was collected. The proportion of left-handers was calculated for each sport and logistic regressions were used to evaluate the probability for a player of holding the racket with the left-hand given his position in the ranking.

Results. TT shows a higher percentage of left-handers (29%) than T (19%), B (16%) and S (14%). Logistic regressions show that, when going up in the ranking, the probability of using the left-hand to hold the racket, increases slightly in TT, B and S, and decreases in T.

Conclusions. Among top-level players, left-handed athletes are more represented in TT than in T, B, and S. This can be due to the fact that, among the analyzed racket sports, TT is that in which the opponents stand with the shortest distance (Groius et al., 2000). Finally, considering the specific position of each player in the ranking as determinant of left-handedness probability rather than commonly-used simple proportion of left-handed players, may represent a useful approach to analyze the left-handedness in the best ranked players of different sports.

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Keywords: *handedness, racket sports, interactive sports*

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FACTORS AFFECTING PARTICIPATION MOTIVES OF SELECTED VARSITY TABLE TENNIS TEAMS

Abstract

The study identified and determined the factors (gender, age, and number of competitive years of experience) affecting participation motives among six selected collegiate varsity table tennis teams coming from two of the country's top collegiate leagues. Eighty-one collegiate athletes completed a demographic questionnaire and the 28-item sports motivation scale. The relative autonomy index (RAI) was then computed from the responses gathered. Using descriptive statistics and independent sample t-test, results showed that there exist significant differences in participation motives in terms of gender and age. Male table tennis athletes scored higher on extrinsic motivation – introjected ($t(79) = 3.06$, $p = 0.00$), extrinsic motivation – external regulation ($t(79) = 3.16$, $p = 0.00$), and amotivation ($t(79) = 3.08$, $p = 0.00$), which they favored the more controlled function. There was also a significant difference in RAI score in terms of gender. Males scored lower in RAI as compared to females ($t(79) = -3.31$, $p = 0.00$). Consequently, 16-18 years old athletes scored higher in IM – K ($t(79) = 2.877$, $p = 0.005$) and AMO ($t(79) = -0.854$, $p = 0.396$) than those who are 19-24 years old. Significant difference was also obtained between RAI score in terms of age with the younger age bracket (16-18 years old) scoring higher than the older age bracket (19-24 years old) at $t(79) = 1.82$, $p = 0.073$. No significant differences were found in the number of competitive years of experience. However, there was a significant difference in RAI score where the number of competitive years of experience (3-5 years of experience) scored higher at $t(79) = 0.823$, $p = 0.41$. Motives for participating in table tennis is not a matter of players being pumped up for games, instead, it is a continuous process of conditioning ones self to automatically give their best efforts whenever they are out on the court, whether in practice or in games.

Keywords: *participation motives, gender, age, competitive years of experience*

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NET TOUCHING DETECTION BY SENSING DISPLACEMENT

Abstract

Accelerometer sensors have been used to try to detect net touching in table tennis due to their easy availability. However, what we actually need to detect is the amount of movement of the net, or, in technical terms, the displacement of the net, not its acceleration. Displacement is dependent not only on acceleration, but also on time of contact between the ball and the net. It is possible that a large acceleration may only cause a small displacement. To convert acceleration to displacement, we need to mathematically integrate acceleration twice with respect to the time of contact. Unfortunately, this parameter of time cannot be easily measured in the case of this sport. Hence the use of accelerometer cannot readily produce a reliable measurement of displacement. Furthermore, most accelerometers such as the widely used MEMS devices work on analogue principle. Drawbacks of analogue signal include susceptibility to noise interference and temperature variations, limited precision and repeatability, and complicated circuitry. As a result, analogue sensor systems are usually more expensive and normally have a specification of bigger margin of output error, especially in mass production. These drawbacks will certainly have negative effects in user confidence and acceptance.

There is a simpler and practicable sensing technology to address these problems. The proposed new approach may enable the formulation and adoption of an objective net touching definition by the ITTF so that disputes in competitions can be avoided. Such a definition is expected to be based on a quantified net displacement which is measurable by a net touching detector with a specified resolution. Developments in this direction will significantly enhance the technology image of the sport.

The new approach makes use of sub-miniature transmissive infra-red (IR) sensor that includes light emitting diode (LED) and phototransistor detector. A small transparent film with an opaque pattern printed is positioned between the LED and detector, and is attached to the top edge of the net. Any displacement of the top edge of the net in any direction parallel to the plane of the film will cause the same displacement of the film. The design of the opaque pattern is such that its relative displacement to the detector will cause on-off digital state changes of the detector. This digital information can then be further processed to produce a visual signal to the referee. The advantage of this design is that the resolution of the displacement sensor is completely controllable by the design of the opaque pattern. In the prototype tested, the resolution is better than 0.4mm, i.e. any displacement greater than 0.4mm in any direction on the plane of the film can be detected and measured. The time of contact between the ball and net, electrical noise interference etc. are no longer a factor.

Keywords: *net touching detection, displacement sensor*

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EFFECTS OF DIGITAL IMAGES ON TABLE TENNIS PLAYERS AND COACHES BASED ON THE THOUGHTS OF MCLUHAN AND THE PATT SYSTEM

Abstract

Among the consequences of the digital revolution and its increasingly inexpensive high quality recording devices is an explosive increase in the number of photographs and videos produced. Table tennis has fully participated in this cultural trend; images, both still and moving, are produced seemingly always and everywhere the sport is found.

This paper examines the unique case of table tennis in its embracing of digital technology. It reveals how digital images have overwhelmed the written word in both sheer girth and frequency of use in communicating many matters of the sport, along with the powerful consequences that have resulted from it. For an effective presentation of the subject matter, this paper restricts its inquiry to the effects of photography and video recordings on the perspectives of players and coaches, with a particular emphasis on the consequences of the efforts of players and coaches to deepen their understanding of how to play the sport via the analysis of these media products. Both the strengths and deficiencies of their method of inquiry are explored. Images are a tremendous resource of a convenient and endless supply of examples of the finest playing behavior of the finest players. However, an excessive reliance on images without systematic understanding of the sport's principles can foster a narrow mechanistic view of the sport.

To achieve the aforementioned goal, this paper will draw on two systems of thought as its foundation. One is the groundbreaking insights of Marshall McLuhan, a Canadian scholar of communication theory, who accurately recognized media not as passive vehicles in their interaction with people but as very active participants in their affects on people's consciousness, awareness, and perception, including many of the behaviors associated with these human dimensions. The other is the system of a **P**rinciples **A**pproach to **T**able **T**ennis (PATT for short). While McLuhan provides us with intellectual basis of media studies, PATT contributes the table tennis understandings for which these communication understandings are to be specifically applied. Because PATT takes a non-mechanistic systematic approach to table tennis, it is uniquely positioned to provide the context for which McLuhan's thought may be applied. Mainly, two book publications are used to support the analysis in this paper: *Understanding Media – The Extensions of Man* (McLuhan, 1964) and *PATT – A Principles Approach to Table Tennis: A foundation for exceptional play* (Olsen and Kim, 2009).

Keywords: *images, media, McLuhan, PATT*

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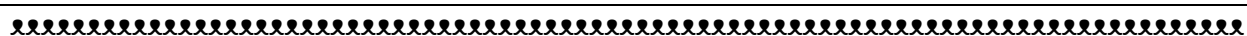
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GROUND REACTION FORCE OF TABLE TENNIS PLAYERS WHEN USING FOREHAND ATTACK AND LOOP DRIVE TECHNIQUE

Abstract

The subjects were 10 excellent ping-pong players in China (20 ± 2 years old, the training years were 11 ± 2). The table tennis techniques of the forehand attack and forehand loop drive were tested, using the measurement methods of the Kistler force plate system (two force plates were used). The two groups of ground reaction force (GRF) data (peak and valley value of the vertical direction, left-right direction and the front-back direction) were analyzed and compared. The dynamic characteristics of table tennis player's forehand attack and loop drive techniques in three dimensions were described. The results showed that the biggest GRF of the attack technique in vertical direction was higher than the loop drive technique, and the biggest GRF of the attack technique in left-right direction and the front-back direction were mostly lower than the loop drive technique.

Keywords: *table tennis, ground reaction force, forehand attack technique, forehand loop drive technique*

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A STUDY ON GRASSROOTS TABLE TENNIS DEVELOPMENT IN NIGERIA

Abstract

Introduction: this account is a follow up of the work we started a few years ago on the development of table tennis from the grassroots in Nigeria. In order to consolidate on our efforts to see that table tennis become popular in our country, we have taken further steps. The overall aim is to improve the standard of the game and also provide some economic benefits for different categories of the citizenry.

Method: the steps we have taken so far include: introduction of the game to children in the age range 4 to 12 years, meeting with sports administrators in both government and private companies to convince them, sensitization of coaches and other sports officials to the benefits of embracing the program, conducting a study on the perceived preference of competitions to developmental program by the major stakeholders (coaches, umpires, sports administrators).

Results: the results we got from the training being given to the children have been very encouraging. Most of the sports administrators have not shown much interest. A study that compared the attitude of major stakeholders to the holding of competitions compared to developmental program showed that a large percentage of the subjects favor competitions.

Discussion: the above account is a pointer to the fact that the program is beset with a lot of challenges. The attitude of major stakeholders constitute a major set back as most of them need to be involved one way or the other in order to carry the program through successfully. The efforts we have made and which we continue to make would surely make most of them have a rethink on their different positions.

Conclusion: it is obvious from the treatise below that majority of people especially, the major stakeholders in the game of table tennis such as: coaches, umpires, established players and sports administrators are more interested in ventures that bring material reward quickly. This tendency is bound to exert some negative effect on achieving the goal of "Grassroots table tennis development". Also of great significance are psychological and social factors. However, we are quite optimistic that if we do persist, we would succeed in changing the mind set of this category of people. It is quite important that we lay more emphasis on developmental program compared to the holding of competitions.

Keywords: *study, grassroots, table tennis, development*

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STUDY OF PRE EVENT ANXIETY OF TABLE TENNIS PLAYERS IN MEN'S DIVISION B

Abstract

The purpose of the study is to investigate the pre event anxiety of Taiwan's table tennis players in men's division B. Total fifty four male tennis players from four different schools serve as objects of the study. With sport competition anxiety test (SCAT, Lu, Chun-Hong's version) and competition state anxiety scale-II (CSAI-2, Huang, Ying-Zhe's version) as analyzing tools, data gathered are further verified by applying descriptive statistics and Pearson product-moment correlation. Study results can be concluded as followed:

1. 'Trait anxiety', 'pre event cognitive anxiety' and 'pre event somatic anxiety' show positive correlation. They show, however, negative correlation with 'self-confidence'.
2. 'Pre event cognitive anxiety' and 'pre event somatic anxiety' are positively correlated. They are, however, negatively correlated with 'self-confidence'.
3. 'Pre event somatic anxiety' and 'self-confidence' are of negative correlation.

Keywords: *trait anxiety, pre event state anxiety, self-confidence*

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PRE-COMPETITIVE AFFECTIVE STATES AND PERFORMANCE IN HIGH LEVEL TABLE TENNIS PLAYERS

Abstract

The aim of this study was to investigate the influence of pre-competitive affective states on sport performance.

Fifteen international table tennis players (13 males and 2 females) aged between 16 and 28 years with 9 to 20 years of practice and 5 to 16 years of experience in competition participated in this study. We used, in order, the PANAS and CSAI-2R questionnaires on two occasions. On the first occasion, the players self-administered the questionnaires retrospectively concerning their best performance. Fifteen days later, they filled again the two questionnaires concerning their less good performance.

Positive affective states' scores were significantly higher during best performance for intensity (3.68 vs 2.64; $p<0.001$) and direction (1.70 vs -0.12; $p<0.001$) compared to the less good performance. Although significant, a minor negative affective state intensity was detected during the less good performance (2.20 vs 1.73, $p<0.05$) compared to the best performance. No significant difference in the intensity of cognitive and somatic anxiety felt during good performance compared to the less good performance. Only self-confidence intensity score was significantly high (3.01 vs 2.44; $p<0.05$) during the best performance. Directional cognitive (0.08 vs -0.64; $p<0.01$) and somatic (0.2 vs -0.24; $p<0.05$) anxiety and self-confidence (1.02 vs 0; $p<0.01$) scores were significantly high during the best performance compared to the less good performance.

We can conclude that all pre-competitive directional anxiety and self-confidence, self-confidence intensity and positive affective states (intensity and direction) can influence positively table tennis players' performance.

Keywords: *table tennis, affective states, high level players, performance optimization*

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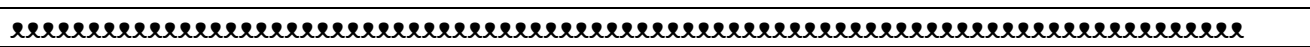
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THE MENTAL IMAGE IN HIGH LEVEL TABLE TENNIS

Abstract

This presentation will stress how elite table tennis athletes in general have been well educated on the physical aspects of training but are often undereducated on the mental aspects. This imbalance has often resulted in some very frustrated athletes who, after devoting tremendous amounts of time physically training their bodies, achieve only mediocre results in competition. They are not obtaining their maximum potential because although they spent months or years physically training their bodies they devoted only seconds preparing the mental aspects in table tennis. It's ironic that many fail to see the inequity.

Today sports psychologists, coaches, and athletes are realizing that training the mind and body together is essential for optimal results. It is imperative to emphasize that the athlete's mental state is just as adaptable to training as his or her physical skills. Utilizing both to maximal effectiveness will result in the highest level of performance.

To achieve optimal results the emotional and mental skills must be trained and developed just as the physical skills. In the last analysis the will to win is just as crucial as the skill to win. To train or program the mind in athletics is a detailed variable process that must be learned and then faithfully followed. Athletes must practice mental training just as they practice physical skills.

The author will emphasize various techniques he has found effective in the mental training of elite table tennis players.

Keywords: *mental training, table tennis*

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BIORHYTHMIC CYCLES AND WINNING PERFORMANCE OF TABLE TENNIS PLAYERS IN THE 2004, 2008 AND 2012 OLYMPIC GAMES

Abstract

The role of the biorhythms in the racket sports players is not widely investigated. Thus, the aim of this study was to assess the effect of the biorhythmic cycles in the winning performance of world-class table tennis players. The studied sample was 24 male and 24 female players who participated in top-8 during the single tournaments of the 2004, 2008 and 2012 Olympic Games. The primary biorhythms (physical, emotional, intellectual) calculation was based on the players' date of birth in relation to the day of their match. The biorhythms were computed with an application which was based on the programming language Pascal. The players' match performances were derived from the International Olympic Committee (table tennis tournament official results). The Kolgomorov-Smirnov test was used in order to determine if the linear model is reasonable for the evaluated variables. The independent samples *t*-test was applied in order to compare the effect of the biorhythms in the players' performance in relation to the gender. The one-way ANOVA with the Bonferroni post-hoc test was applied for the evaluation of the biorhythmic cycles' effect in the players' performance in the Olympic Games. Furthermore, the receiver operating characteristic (ROC) curves were applied in order to illustrate in graphical plots the discrimination of biorhythms in the players' peak performance relatively to the gender. From the results it was shown that the players' physical (t=-0.42, df, 38, p=0.68), emotional (t=0.25, df, 38, p=0.83) and intellectual (t=-0.72, df, 38, p=0.47) phases did not differ significantly between the genders. The ANOVA multiple comparisons showed that the players' biorhythms did not significantly differ in the last 3 Olympic Games. However, the ROC presented a high sensitivity (0.65) of the physical phase in the male players' winning performance while the area under the curve of the ROC (0.87) showed that the emotional phase is strongly related to the female players' peak performance. A qualitative approach confirms the role of the biorhythms because both male and female gold medal winners in the 2004, 2008 and 2012 Olympic Games competed during the positive physical and emotional phases. In summary, this study presents that the biorhythmic cycles influence the winning performance in the racket sports. Hence, the physical energy and emotional stability seems to interact with the peak performance of world-class table tennis players.

Keywords: biorhythms, racket sports, physical ability, performance prediction

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SMALL WORLD TOPOLOGY AND COMMUNITY STRUCTURE IN TABLE TENNIS COMPETITION NETWORKS

Abstract

We studied table tennis competition networks in Taiwan from 2004 to 2011. It is interesting to find the scaling crossover phenomenon and small world topology. The small world quotient for each year was much larger than 1, which indicated that the table tennis competition network in Taiwan was a highly optimized structure, where round robin and knockout matches constitute the competition network. Excellent players won more games, thus who had more opportunities to compete with more opponents. Therefore, the effect of "strong-get-stronger" will lead to the power law distribution in the regime of high connections. However, the scaling crossover phenomenon can be observed in the regime of low connections, which is owing to the special design for preliminaries, thus fully connected cliques embedded in the network topology can be expected. On the contrary, the theoretical BA model (Barabási and Albert, 1999) displayed the power law distribution in the whole regime, and the small world quotient was not much larger than 1. The main difference between the competition and BA networks was the problem of fully connected cliques. Finally, with detailed discussions we may say that there are two different kinds of preferential attachment in human made competition networks, including inner- and inter-tournament preferential attachments. Therefore, the topology of table tennis competitions is a network with community structure.

Keywords: *table tennis, small world, scaling crossover, community structure*

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PSYCHOLOGICAL FACTORS TOWARD TO DOPING IN IRANIAN TABLE TENNIS PLAYERS

Abstract

Background: doping is regularly studied in sports, but we have found no such data for table tennis. We have studied doping in athletes competing at the Iranian Nationals 2011-2012. The anonymous questionnaire for studying doping and psychological factors was used.

Objectives: this study aimed to determine the relations between cognitive variables (self-efficacy, locus of control, and dysfunctional attitudes) and psychological factors with using doping agents in table tennis players.

Methods: we conducted a case-control study in Iran among table tennis players using 50 athletic drug users with reported use as a case group and 50 athletic nonusers and 50 nonathletic nonusers as controls that were matched on salient demographics (aged 18 years or older). Controls were selected by a simple random sampling. They were then studied by self-efficacy questionnaire, locus of control scale, dysfunctional attitude scale, and general health questionnaire. Hypotheses were tested by variance analysis and Tukey's test. In addition, outcome measures included sport orientation (win and goal orientation and competitiveness), doping attitude, beliefs and self-reported past or current use of doping. A structural equation model was developed based on the strength of relationships between these outcome measures.

Results: our findings showed that athletic drug users had a lower self-efficacy, more dysfunctional attitudes, and exhibited external locus of control rather than control groups. They were also more sensitive to psychological morbidity. Most of relations were statistically significant.

Conclusion: our findings were in accordance with the theoretical basis of cognitive psychology. More than 85% of all the players included in our study do rely on coaches. In other words, the pressure of being the first by coach, join in national team and stable in national team, fear of failure competition and winning at any cost are important factors for players that they are toward doping. In conclusion, we strongly suggest permanent educational anti-doping programs and sport psychology for table tennis athletes as well as for their coaches and physicians.

Keywords: *table tennis players, doping, drug abuse, Iran*

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THE USE OF THE SANDPAPER RACKETS DURING THE 2013 WORLD CHAMPIONSHIP OF PING PONG

Abstract

Abstract: since the advent of sponge rubber rackets in the early 1950's, traditional sandpaper rackets used in national and international competitions with such longer rallies, less spin and speed have slowly declined and eventually almost forgotten. We investigated the performances of the participants during the 2013 world championship of ping pong held in London, England from January 5-6, 2013. The event, shown in Sky TV, offered cash prizes and participated by 64 players from 18 countries (39 rubber, 20 hardbat and 5 sandpaper players) who were selected by Matchroom Sports. To level the playing field, "specifically made" sandpaper rackets, provided by the organizers were used. The double elimination format was played in the qualifying stage with 8 groups of 8 players vying for the top 4 spots going into the final stage where the single elimination format was played with the best of 3 games using the current ITTF rules. A "double pt." rule was also introduced. The following results showed the top 32 players who qualified in the final stage down to the finals:

Players per racket orientation	Top 32 (B)	% (B /32)	Top 16 (C)	% (C/16)	QF (D)	%	SF (E)	%	Finals	%
Rubber -39	20	62.5%	13	81.25%	6	75%	4	100%	2	100%
Hardbat - 20	10	31.25%	2	12/5%	1	12.5%	0	0%	0	0
Sandpaper = 5	2	6.25 %	1	6.25	1	12.5%	0	0%	0	0
	N= 32	100%	N =16	100%	N=8	100%	N=4	100%	N=2	100%

The results also confirmed that sponge rubber players, who advanced to the final rounds can adapt to sandpaper rackets. With limited or no hardbat training, we felt that some rules can be changed to achieve more rallies with an epic sense and greater balance between defense and offense to further separate significant differences between sponge/rubber and sandpaper game. However, because a significantly statistically greater number of participants used sponge rubber rackets, inconclusive data and evidence exist to determine whether full time sandpaper had an advantage over part-time sandpaper enthusiasts that otherwise use sponge rubber rackets. Furthermore, the format of the competition mirrored to a large extent the modern sponge rubber sport.

Keywords: *sandpaper, hardbat, sponge rubber, double point*

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DIFFERENCES IN PHYSICAL PERFORMANCE USING NEW APPROACHES IN FITNESS ASSESSMENT BETWEEN ELITE ATHLETES IN TABLE TENNIS AND OTHER RACKET SPORTS

Abstract

One important aspect in order to achieve peak performance is to understand the precise energy and movement demands and to choose the appropriate instrument in order to come up with a standard for a particular sport. This pre-experimental, one-shot study aimed to determine the differences in physical performance between elite athletes in table tennis and other racket sports using new approaches in fitness assessment. Thirty-three (N= 33) elite athletes from three racket sports (table tennis, N=10, tennis, N=11 and badminton, N=10) were tested to measure the following components: 1) Body fat percentage using bio-impedance analysis (BIA) technique 2) reaction time, upper and lower body power, agility, speed using the Chronojump Bosco® system, a free software developed by Mr. Xavier de Blas from Spain, and 3) cardiovascular endurance using the Polar® heart rate watch, model FT-40. T-test for independent samples was used to determine the significant differences between table tennis and other racket sports at $p < 0.05$ level of significance. Results showed that there were no significant differences between table tennis and tennis in terms of % body fat ($p=0.089$), VO_2 max ($p=0.739$), reaction time (left foot, $p=0.25$), agility ($p=0.124$), upper and lower body power ($p=0.466$ and $p=0.179$). However, significant differences were noted in reaction time (right foot, $p=0.008$) and speed ($p=0.01$). There were no significant differences between table tennis and badminton in terms of VO_2 max ($p=0.502$), % body fat ($p=0.245$), reaction time (right foot at $p=0.887$, left foot at $p=0.657$), speed ($p=0.341$), agility ($p=0.339$) and upper body power ($p=0.353$). Significant difference was only noted on the lower body power ($p=0.025$). The results conclude that elite athletes in racket sports should have the same level of fitness. True-experimental design is also recommended by assigning control groups in order to design an effective intervention program.

Keywords: *fitness assessment, BIA, Chronojump Bosco® system, Polar® heart rate watch*

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RELATION BETWEEN SUCCESS AND ANTHROPOMETRIC INDEX AND PHYSICAL FITNESS IN ELITE MEN'S TABLE TENNIS ATHLETES

Abstract

The aim of this study is determine anthropometric index factors (height, sitting height, arm span, weight and body fat percent) and physical fitness components (endurance muscle, flexibility, anaerobic power, agility, speed and reaction time) and relation to success in qualification for Iran national men's table tennis team.

Subjects referred to physical fitness assessment center of National Olympic Academy (N.O.A.) of Iran and were assessed for height, sitting height, arm span, weight and body fat percent with bioelectric impedance method. For physical fitness assessment factors we used: 4x9 meter run (agility test), 40 yard run (dash), 30 s Wingate test (anaerobic power), 1 mile run (aerobic power) and reaction time.

All machines were made in Iran and used in physical fitness assessment center of N.O.A of Iran to assess physical fitness of all Iranian national teams.

10 elite men's athletes of Iran national table tennis team participated in this study and after the tests they participated in a qualification tournament for Iran national table tennis team.

Relation between success in qualification of national team and anthropometric index and physical fitness has been evaluated.

In summary after Pearson test it has been shown that:

-between some of the components in physical fitness factors there is a significant relationship ($p < 0.05$),

-variance result after analyses has shown that between success in qualification table tennis and anthropometric and physical fitness test there is no significant relationship ($p > 0.05$).

Keywords: *success, physical fitness, anthropometric data*

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COMPARISON OF OLYMPIC WINNER LI XIAOXIA'S TECHNIQUES AND TACTICS BETWEEN PREPARATORY TRAINING AND COMPETITION IN LONDON OLYMPIC GAMES

Abstract

Introduction: there is close connection between players' use of techniques and tactics in the preparatory training session and during the actual competition. This study compared the Olympic winner Li's technical and tactical indices before and during the competition, and further analyzed the relationship between her technical and tactical indices in these two sessions. **Method:** 1. Twelve times of observation were made about Li's training in preparatory session from June 5th to July 7th in 2012 and six matches in the Olympic Games were selected for the present study. 2. Observation indices: (1) $TSR_{1,3}$, $TUR_{1,3}$ and $CSR_{1,3}$, $CUR_{1,3}$ represent the scoring rate and usage rate of the first and third strokes before and during the competition respectively. (2) TSR_5, TUR_5 and CSR_5, CUR_5 represent the scoring rate and usage rate of the fifth stroke before and during the competition respectively. (3) $TSR_{\geq7}$, $TUR_{\geq7}$ and $CSR_{\geq7}$, $CUR_{\geq7}$ represent the scoring rate and usage rate of the seventh and after strokes before and during the competition respectively. (4) $TSR_{2,4}$, $TUR_{2,4}$ and $CSR_{2,4}$, $CUR_{2,4}$ represent the scoring rate and usage rate of second and fourth strokes before and during the competition respectively. (5) $TSR_{\geq6}$, $TUR_{\geq6}$ and $CSR_{\geq6}$, $CUR_{\geq6}$ represent the scoring rate and usage rate of the sixth and after strokes attack during the competition respectively. **Results**: 1. The scoring rate of the first and third strokes is higher in the competition than in the training, but the difference is not significant. The usage rates of those two strokes are similar. 2. The scoring rate of the fifth stroke in the competition is slightly higher than that in the training period. But the usage rate of fifth stroke is significantly higher in the competition than in the training. 3. The scoring rate of the seventh and after strokes is significantly higher in the competition than in the training period. And the usage rate is also slightly higher in the competition than in the training. 4. The scoring rate of the second and fourth strokes in the actual competition is lower than in the training period, but the difference is not significant. The usage rate of those two strokes are 64.27% ($CUR_{2,4}$) and 63.85% ($TUR_{2,4}$)($t= 0.095$, $P>0.05$) respectively. 5. The scoring rate of the sixth and after strokes in the competition is lower than that in the training. The usage rates of those two strokes are very close. **Conclusions:** except for CUR_5 and $CSR_{\geq7}$, there is no significant difference between Li's techniques and tactics used for competition and trainings. So those indices of techniques and tactics can be used for the evaluation of the training effect in the preparatory period and the player's competition performance in the future.

Keywords: *comparison, techniques and tactics, training, Olympic Games*

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PROMOTE INTERNATIONAL INFLUENCE OF TABLE TENNIS - ON STRATEGIES OF CAPTURING SPECTATORS, STRESSING BOTH ON COMPETITIVENESS AND RECREATION

Abstract

Abstract: the International Table Tennis Federation (ITTF) is a sport organization that has 217 member associations. Its scale is only second to the International Volleyball Federation (FIVB). Table tennis has entered a stage characterized by "aggressive offensive and forceful defensive" where new skills and strategies keep emerging. Yet the development and promotion of table tennis sport is not free from problems. The salient problem lies in that, so far China dominates in sense of the popularity of the sport as well as the number of top players. What is more, even in China, the competitiveness of table tennis is stressed over its function of bringing health and happiness to the ordinary people, participants and spectators alike.

Subjects: professional coaches, college table tennis instructors, college student players, administrators, and community residents.

Conclusions and suggestions: 1.World tours by famous table tennis stars to showcase table tennis can be a promising way of generating laughter, happiness and health; of creating a new atmosphere and attraction concerning table tennis; of propelling the popularizing table tennis worldwide. 2. Establish international table tennis training centers and/or camps to exchange practical training experience. Hold international table tennis training programs and seminars to promote academic communication nationally and internationally on regular bases, too. 3. Raise international youth table tennis funds sponsored by corporations. Such funds can be used to provide countries and regions where table tennis is underdeveloped and less competitive; to involve their youth in table tennis; to cultivate gifted young players and to stage non-profit table tennis activities internationally. 4. Map out concrete and according measures to popularize table tennis in different countries and regions, given the fact that table tennis is unevenly developed over the continents. More financial aid from the governments is to be included. 5. Enrich the meaning of table tennis by table tennis museums, table tennis stamp fairs and book fairs, table tennis textbooks, DVDs, etc. 6. Work out a commercial operation of table tennis matches, modeling after the NBA marketing practices. Develop the Chinese table tennis super league into the most fascinating matches attracting audiences all over the world. 7. The ITTF shall make unrelenting efforts on the revisions of existing rules, cooperation with the media for greater coverage of table tennis events, and a smooth transition to the use of seamless table tennis balls in 2014.

Keywords: *table tennis, national influence, promotion, recreation*

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A TRAINING SUPPORT SYSTEM FOR TABLE TENNIS SERVICE USING KINECT

Abstract

In table tennis, service is one of the most important skills. Normally, players analyze their services with videos which were taken by themselves or their teammate. This method has some problems. At first, it takes much time to playback service scene manually, repeatedly, and it would lessen the efficiency of training. Other problem is the analysis can be too subjective to compare multiple services. Human's observation can be inaccurate, and analysis should be with objective data. There are systems which can solve the problem, e.g. motion capturing system. But they are too large-scale, expensive and difficult to use in many cases. We propose a simple and cheap system which provides helpful information for table tennis service training based on computer vision. **System architecture**: it is composed of a PC and a Kinect. Kinect is a device which has ability to obtain depth and color image simultaneously. Kinect is set at opposite side of the server side and take depth and color image sequences of service scene. From the image sequences, table's planar model and ball's 3D trajectories are reconstructed, and then the system can obtain and display information of service, such as velocity, maximum height in a trajectory, time of bouncing, position of bouncing, angle of incidence, angle of reflection. In addition, the system records a video of service scene automatically on the basis of first bouncing time, and provides the video to users immediately. **Algorithm**: table's planar model can be estimated from the depth data which are inside the rectangle composed of the corners of a table. Corners detection can be regarded as a problem that which 4 points should be chosen among all cross points of white line in a color image. The 4 points are chosen based on the color feature and shape feature of the rectangle composed of the cross points. Ball's trajectory model can be estimated from a sequence of ball's 3D positions. Motion model is approximated as constant acceleration. Since constant acceleration model can be solved as simple equations which require only 3 ball positions and times in a trajectory, trajectory estimation can be stable and fast. Ball positions which used as input of the equation are detected with depth-color based detection and trajectory based filtering. More detail, ball candidates are detected with logical addition of the results of background subtraction in color and depth image and white segment extraction, and then false positives are removed with trajectory based filtering, which removes the candidates around which no candidates exist in previous and next frames. **Conclusion**: a training support system which provides information and videos of service has developed. The service analysis will be shorter and more objective by the system. In the future, it will be important challenge to develop a system which can provide information about serving form.

Keywords: *Kinect, training support system, trajectory reconstruction*

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A SHORT TIME PERFORMANCE ANALYSIS IN TABLE TENNIS

Abstract

It is important to evaluate player's performance and to analyze characteristics of play for considering tactics in table tennis. For making the analysis more accurate, objective data should be used. That's why the interest of performance analysis has been increased in table tennis. Analysis in table tennis, however, has been conducted without objective data in many cases. The huge amount of the time and the work of collecting data are the likeliest reasons why objective data has not been used. We propose a short-time and effective method of performance analysis in table tennis. **Proposing analysis**: the key point of the analysis is to use *shot number*. *Shot number* stands the number of shots in a rally. For example, service is 1st, service receive is 2nd, and the next is 3rd, and so forth. In table tennis, many practices are conducted based on challenges of each *shot number*. This means that we can understand players' characteristics in the aspect, if we know the scoring and losing rate of each *shot number*. In fact, since shots are performed in turns by each player, the data can be easily derived from a *shot number* of a scoring shot and server (and receiver, if the event is doubles) in a rally. *Shot number* can be recorded easily, just counting shots in a rally, and server and receiver can be determined from point and game score in all rallies except first rally in a match (or a game, if the event is doubles). Although the amount of work and time are small, the analysis provides many data. **Analysis example**: to show how a performance analysis can be conducted with the proposed method, 4 matches from an international competition played by player-A were analyzed. The 2 matches in which scoring rates of player-A were greater than opponents' ones will be herein referred to as "dominating matches" and the others will be referred to as "dominated matches". In dominating matches, the scoring rates at after 3rd shot were greater than opponents' ones, while the scoring rates at before 4th shot were smaller than or equal to opponents' ones. In addition, in dominated matches, the averages *shot number* of scoring shot was smaller than dominating matches' ones and the scoring rates at after 3rd shot were not greater than opponents' ones. The result shows player-A was good at long rally. To win player-A, the techniques and tactics to score early phase, such as forceful shot in 3rd, would be important. **Conclusion**: a method of short-time performance analysis in table tennis has been proposed. Many data about characteristics have been obtained through an analysis conducted with the method. In the future, establishing a method of short-time analysis which provides detail data will be important challenge.

Keywords: *performance analysis, table tennis, shot number*

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THE EFFECTS OF TRAINING INTENSITY IN INSULIN RESISTANCE AND RESISTIN IN TABLE TENNIS PLAYERS

Abstract

Purpose: to investigate the changes in insulin resistance and resistin of the college table tennis players who received different training intensities.

Methods: this is a longitudinal study of 20 college table tennis players who received high intensity training for 2 months and then switched to low one for 6 months. We measured all participants, including body composition, insulin response in oral glucose tolerance test (OGTT), and blood lipid and resistin during the training and detraining stage.

Results: the insulin concentration at OGTT 30 min and the blood glucose level at OGTT 90 min of the post-season stage were significantly elevated (insulin: 28.24 ± 3.68 µg/ml vs. 40.93 ± 4.11µg/ml, $p < 0.05$; glucose: 98.60 ± 4.13 mg/dl vs. 111.00 ± 4.07 mg/dl, $p < 0.05$). We also found that insulin area under curve (IAUC) in post-season stage was up to 2 times compared to pre-season stage (1226.19 ± 331.53 vs. 2346.34 ± 326.34, $p < 0.05$) and serum resistin concentration in pre-season stage was significantly higher than the post-season stage (2.10 ± 0.27 ng/ml vs. 1.14 ± 0.14 ng/ml, $p < 0.01$). Furthermore, significant negative correlations between resistin and insulin at OGTT 120 min ($r = -0.714$, $p < 0.01$) and between resistin and IAUC ($r = -0.695$, $p < 0.01$) during high intensity exercise was also noted.

Conclusions: improvement of insulin sensitivity and decreased resistin in young and healthy people were found during the high training stage, but not during the low training stage.

Keywords: *training intensity, resistin, insulin sensitivity, glucose tolerance*

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TECHNIQUES AND TACTICS ANALYSIS RELATED TO PERSONALITY IN DOUBLE TABLE TENNIS

Abstract

This research was designed to develop a techniques and tactics analytic model, based on the personality of players' in double table tennis. The result of this research was hoped to provide as a training guideline for coaches and players. The sample included the players who participated in men's doubles in Chao-yang table tennis competition which was held in 2012. A total of 48 questionnaires were distributed, 21 competitions were recorded which involved 10 different universities. The content of questionnaire was enclosed in the appendix. First, a video observation method was used and a total of three doubles games which involved five pairs of players, 10 players in total, were reordered in pilot study. In the result, four different combinations of personalities were compared, "self-control vs. self-control, self-control vs. aggressive, intellectual vs. aggressive and aggressive vs. aggressive. This study analyzed for the first ball and the third ball, a total of 131 balls, and take advantage of the research in developing the doubles technical and tactical of analytic model prototype for analysis. The following results were found. First of all, there was significant correlation found between the successful implementation of tactics and victory. Secondly, a significant association was also found between different personalities and the number of successful tactics implantations, which imply that the matching between personality and the successful implementation of tactics is crucial. Finally, the doubles techniques and tactics analytic model, using a personality method developed in this research is feasible and practical.

Keywords: *table tennis, personality, techniques and tactics, analytic model, multimedia database*

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EFFECTS OF BOOSTER ON BOUNCE PROPERTIES OF RUBBER

Abstract

Rule violation in table tennis occurs in relation to rubber. This violation is fundamentally different from other violation such as doping. Doping is prohibited from the medical reasons. Violation of doping is committed in secret. One who is involved with doping is severely punished. On the other hand, violation of rubber takes place in the very face of days, even in the presence of umpires. Many players use booster to enhance performance of rubber. Not only players but also manufacturers have been intensely pursuing performance upgrade of equipment for many years. As a result, various kinds of methods have been invented one after another. Most of manufacturers immerse vulcanized rubber in mineral oil to increase elasticity. This immersing process is conducted against rubber which is regarded as a completed industrial product. It is clearly post-processing or post-treatment. This post-treatment violates the law 2.04.07 of ITTF regulations. The law 2.04.03.01 describes that the sheet is natural or synthetic rubber. It is injustice to add a large amount of oil to rubber not from the necessity in manufacturing but for the purpose to enhance performance. Rubber sheets treated by a large amount of mineral oil or booster should be banned.

It is anticipated that table tennis will lose the image of a sound sport if the situation mentioned above is permitted. If the post-treatment is permitted, rules of equipment of table tennis will collapse and equipment will fall into a state of chaos. It is natural that players are interested in post-treatment under the current circumstances. Today many players are becoming more nervous about post-treatment using booster than enhancement of their own playing skill and ability. It is a regrettable phenomenon. On the other hand some players follow the rule and do not use any booster. Such players are faced with an unfair situation. Such kind of unfairness is not found in other sports. Next, an experiment made in Japan is explained. A simple method has been proposed to test the bouncing properties of rubber. In this experiment a small steel ball (9mm diameter and 3g mass) was used as the test ball. The ball falls on the rubber from the position of 50 cm high and bouncing height of the ball was measured. The results show that the bouncing height is remarkably large in the case when the rubber was treated by booster. The equipment in the experiment can be used as the standard device to check rubbers with abnormal elasticity. The above experiment was conducted with the cooperation of JTTA (Japan Table Tennis Association), JISS (Japan Institute of Sports Sciences), researchers, engineers and other people concerned.

Keywords: *rubber, booster, unfair situation*

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GAME ANALYSIS IN TABLE TENNIS BASED ON DOUBLE MOVING SCORE PROBABILITY

Abstract

Introduction: Double moving score probability is a way to describe the changing situations of competition. This study aims to find out some basic characteristics of table tennis matches through a comparison of the differences between the winner and the loser.

Methods: 2.1 Eighty eight single matches were randomly selected from the 2008-2012 world top 20 male players (based on world ranking in January 2013). Among them, 44 matches were for the winning group, and the other 44 matches were for the losing group.

2.2 Double moving score probability (DMSP) was calculated by the unit (1 or 0) based on scoring (1) and losing (0) points, and the average of every 4 scores is calculated in turn.

2.3 DMSP ≥ 0.625 is defined as high stated when the player is in a good form; 0.625 > DMSP > 0.375 is defined as strained state when the player gets into a confrontation with the opponent; DMSP ≤ 0.375 is defined as the low state when the player is not in a good form.

2.4 Effectiveness value (EV) of DMSP = frequency rate (FR) × mean value of DMSP

Results: 3.1 In the match, the frequency rates of high state for the winning and losing groups were 41.86% and 25.01% (t = 9.310, P < 0.01) respectively. But they were very close in strained state: 31.38% and 31.52% (t = -0.095, P > 0.05) respectively. In low state it turned out to be in a lower percentage in the winning group than that in the losing group: 25.76% and 43.48% (t = -9.619, P < 0.01) respectively.

3.2 The mean value of DMSP in high state was 0.738 for the winning group, and 0.710 for the losing group (t = 4.652, P < 0.01), while in strained state, it was 0.502 for the winning group and 0.496 for the losing group (t = 2.795, P < 0.01). In low state, it was 0.281 for the winning group and 0.263 for the losing group (t = 3.218, P < 0.01).

3.3 In high state, effectiveness value of DMSP was 0.310 for the winning group, and 0.179 for the losing group (t = 9.424, P < 0.01). In strained state it was 0.158 for the winning group, and 0.156 for the losing group (t = 0.224, P > 0.05). And in low state it was 0.075 for the winning group, and 0.114 for the losing group (t = -8.253, P < 0.01).

3.4 Further analysis revealed that there was little correlation between competition winning probability and frequency rate of player's high state, strained state, and low state. But there was moderate correlation with the mean value of DMSP, and high correlation with effectiveness value of DMSP of the three states, r = 0.977, r = 0.942, r = 0.805 respectively, with a significant difference (P < 0.01).

Conclusions: The game analysis based on double moving score probability could demonstrate the situational characteristics of the winner and loser, and reveal that the player's effectiveness value of DMSP in high state is playing an essential role in table tennis match.

Keywords: *game analysis, double moving score probability, competition winning probability*

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THE ANALYSIS OF TABLE TENNIS PLAYERS GUO YUE AND LI XIAOXIA'S TECHNIQUE AND TACTICS UNDER ORGANIC GLUE AND INORGANIC GLUE

Abstract

After the 2008 Beijing Olympic Games, the ITTF prohibited the use of organic glues and the table tennis world entered an era of inorganic glue which brings great changes on the spin, speed, and strength of table tennis balls. This article adopted video observation and analysis, statistical analyzing and documentary review methods to analyze top Chinese women players Guo Yue and Li Xiaoxia's technique and tactics under the organic and inorganic eras. It was found that after the implementation of inorganic glue, during the phase of attacking after service, Guo Yue's service placement tends to be short and to the middle of the table. In addition, successful third ball attacks decreased. She increased the use of her backhand and made more mistakes on wide angle forehand loops. During the phase of attacking after receiving, Guo Yue is more aggressive while receiving serves. However, she tends to short push balls where she is uncertain of the spin. Short pushes are low quality ball returns and provides an opportunity for the opponent to attack. During the phase of being locked, the applied rate was increased while the scoring rate was decreased. Li Xiaoxia, during the phase of attacking after service, her third ball application and scoring rate decreased. On the third ball, Li Xiaoxia increased the use of her backhand, but decreased the amount of threatening shots. As opposed to Gue Yue, Li Xiaoxia's service placement is more dispersed. She coordinated short balls to the middle with long and short balls to the backhand of the opponent. Li Xiaoxia received serves the same as she did in the organic glue era, and the applied rate and the scoring rate remained the same but lacked attacking awareness. During the phase of being locked, Li Xiaoxia was locked down more often and her scoring rate while being locked down decreased. She executes strong consecutive forehands, however, defensive forehands are poor and many avoidable mistakes were made. The recommendation for women table tennis player in the inorganic glue era: as the rally rounds increase, the female athletes should enhance the phase of locking ability and improve the utilization and threats of the forehand. In addition, more attention should be put on strengthen and physical training.

Keywords: *video analysis, organic glue, inorganic glue, techniques and tactics*

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A STUDY OF UNIVERSITY STUDENT'S FLOW EXPERIENCE - A CASE STUDY OF PING-PONG COURSE IN TSINGHUA UNIVERSITY-

Abstract

This article discussed university students' flow experience in an educational setting. There were 8 class sessions total, and total of 306 "flow scales" distributed to all students and returned, 100% return. After reviewing the scales, eliminated 19.28% of the incomplete and invalid scales, which leaves 80.72% valid scales, total of 247 student participants (56.68% male, 34.82% female) from variety field of majors. This research used "dispositional flow scale-2" (DFS-2, Jackson and Eklund, 2004) as the means to examine the flow state experience.The authors started the study by participating and investigating in a ping-pong course from Tsinghua University (as ping-pong classes for the rest of this article) to discuss the students' physical education experience characteristics from the psychological point of view. The authors employed literature review method, observational method, as well as questionnaire / scales analyses to conduct the study. We found that the students' ping-pong skills are nearly non related to their flow experience (r = 0.08). However, the students competition grades and results are moderately related to their flow experience (r = 0.21). In light of this, the authors then discuss and analyze the ping-pong class strategy application and its content. This study started from a fairly new perspective. In its application, there's still a need from other sports educators or coaches to look into the different learning environment and setting for improvement. Applying the flow experience indicates much meaning for further research down the road, which will help students to develop more positive learning attitude and interest, advance the course with their passion and input.

Conclusion:

1."Forehand technique" and flow experience shown weak correlation.

2. Competition skills and flow shown moderate correlation.

Suggestion: the authors suggest that the coach and instructors could use these four applications of the flow indicators to advance class efficiency: 1. Balance between challenges and skills; 2. Action and awareness are merged;

3. Clear goals;

4. Personal control over the situation or activity.

Reference:

Jackson, S.A. and Eklund, R.C. (2004). The Flow Scales Manual. Fitness Information Technology, Inc. Publishers Graphics. Morgantown, W.V. USA.

Keywords: *flow experience, sports education, ping-pong course*

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SET-POINT TACTICS AND TRAINING STRATEGY FOR WORLD LEVEL COMPETITIONS: WHAT WE CAN LEARN FROM THE LONDON 2012 OLYMPIC TABLE TENNIS GAMES

Abstract

Similar to a tight basketball or baseball game in late/extra minutes or innings, table tennis competitions often reach a tight late game situation (score 9-9 and after) of each set in world level matches. In this study, we first analyzed the matches played in the London 2012 Olympic games to derive the percentage of sets entering the tight late game situation under different categories, such as the game margin (4:0, 4:1, 4:2, and 4:3, an indicator of the skill differential between the athletes) and genders (tables attached). The result reveals the frequency and importance of having set-point tactics and training strategy to prepare for world level competitions. We then used team China as the study target to describe the preparation logics and the methods employed in their pre Olympic training camp. Interviews and literature review were both used to collect information about the training content and intensity. At the end, coaching suggestions will be discussed in this study about maneuvers of different score situations to execute the designed services and strokes based on the scouting report to create technical and mental advantages over opponents.

Men's Singles

Game Margin	4:0	4:1	4:2	4:3
Matches Total	22	21	11	15
Sets Total	88	105	66	105
Sets reach score 9-9 and after	17	41	25	39
Frequency (%)	19%	*39%*	*38%*	*37%*

Women's Singles

Game Margin	4:0	4:1	4:2	4:3
Matches Total	20	21	17	12
Sets Total	80	105	102	84
Sets reach score 9-9 and after	15	27	38	34
Frequency (%)	19%	26%	*37%*	*40%*

Data are derived from http://www.london2012.com/table-tennis.

Keywords: *coaching, Olympic games, set point, tactics, training strategy*

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THE KINEMATICS ANALYSIS ON THE FOREHAND TECHNIQUE OF LOOP DRIVE THE DOWN-SPIN BALL OF WANG HAO AND MA LIN

Abstract

As an offensive technique, the forehand technique of loop drive the down-spin ball is one of the main score means in table tennis matches, especially for the pen-hold grip players. The subjects of this study are the famous pen-hold grip players in the world, the gold and silver medalists in 2008 Olympic games, Wang Hao and Ma Lin. Using the kinematics methods of Qualisys-MCU500 system (6 cameras), the forehand techniques of loop drive the down-spin ball of Wang Hao and Ma Lin were tested. The kinematics data such as joint angles, and bat velocity were obtained. The kinematics characteristics were described. The difference between Wang Hao and Ma Lin were found. The results and conclusions are the followings. (1) There were individual differences on the forehand technique of loop drive the down-spin ball between Wang Hao and Ma Lin. (2) The ball speed of Ma Lin (13.95 ± 0.31 m.s^{-1}) was faster than that of Wang Hao (13.53 ± 0.35 m.s^{-1}). (3) During the stage of the racket backward, compared with Wang Hao, the right upper arm of Ma Lin was closer to the body, the extension degree of the right elbow and the flexion degree of the right knee was bigger. Ma Lin rolled and pressed the trunk and hip down more fully, and Wang Hao rotated the shoulder right and backward. (4) During the stage of attacking ball, compared with Wang Hao, at the time of attacking ball Ma Lin's angle of right elbow was bigger, the right upper arm of Ma Lin was closer to the body, Ma Lin's flexion degree of right knee was bigger, the extension degree of Ma Lin's hip was bigger.

Keywords: *table tennis, technique and tactics model, real time, feedback*

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THE DEVELOPMENT SITUATION AND COUNTERMEASURES RESEARCH ON CHINESE UNIVERSITY TABLE TENNIS CHAMPIONSHIPS

Abstract

By means of literature, statistical analysis, comparison and logical argumentation this paper studies the Chinese university table tennis championships (CUTTC) organized by the Chinese university table tennis association affiliated to the federation of University Sports of China in recent 10 years. Combined with years of firsthand experience in organizing work and reflection, the authors introduce the progress achieved, analyze and sum up its existing deficiencies and propose the countermeasures and improvement suggestions accordingly.

CUTTC has made notable progress in its influence, event organizing and management, event marketing and promotion of university table tennis development around China; meanwhile it also has imperfections. The current frequency and scale of championships can't fully satisfy the participating needs of about a thousand universities. The grouping and player's eligibility check has yet to be perfected and improved. The source of funding channel is monotonous and the operation of marketing is not ideal. The internal cultural value of event lacks attention and exploitation. Through investigation and argumentation, this paper puts up pertinent proposals. First, innovate the classification system and improve the system of play and participation methods. Secondly, enforce the player's eligibility censorship to maintain a fair competition arena. Thirdly, attach great weight to event image packaging, actively broaden the funding sources. Finally probe the dynamic integration of sports culture and campus culture. As the communication and learning platform for table tennis players and coaches from various colleges and universities, CUTTC should cooperate with the Chinese ministry of education to cultivate, train and select elite university athletes to take part in Universiade, national and international major competitions, thus contribute to China's Olympic proud plan and sustainable development strategy of competitive sports. This study has theoretical and practical meaning in improving university table tennis competition system, optimizing the training system of table tennis reserve talents and facilitating the sustainable development of CUTTC.

Keywords: *Chinese university table tennis championships, development, countermeasures*

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WHAT IS THE DIFFERENCE BETWEEN MALE AND FEMALE PLAYERS' TECHNIQUE USAGE IN TABLE TENNIS MATCHES?

Abstract

Introduction. The present study aims to compare the technique usages of elite male and female players and to find out the differences between them.   **Methods.** 2.1 Two hundred single matches were randomly selected from the 2010-2012 world top 20 male and female players (based on the world ranking from January 2012 to January 2013). Among them, 100 matches were for male players, and the other 100 matches were for females.

2.2 The formula of technique effectiveness (TE): $TE = A + B \times [(1+UR)^{SR-0.5}] - C \times [(1+UR)^{2(SR-0.5)}]$

2.3 The formula of competition performance (CP): $CP = 22 - \sqrt{\sum_{i=1}^{n}(x_i - 11)^2 / n}$

Results. 3.1 The average score for each male and female game is 18.29 and 18.32 respectively, showing no differences between them. However, the male scored much more in serve, receive and the fourth stroke in each game than the female ($P<0.01$); while the female players gained significantly more scores in the after fourth strokes than the males ($P<0.01$). No difference is found between male and female's scores in the third stroke. The male players lost obviously more scores in receive and the third stroke than the females ($P<0.01$, $P<0.05$). No significant difference is found between the male and female's lost scores in serve and the fourth stroke. The female lost more scores in the after fourth strokes than the male ($P<0.01$). 3.2 In each match, the male's scores in serve, receive and the fourth stroke occupies significantly higher proportion in all scores than the female's ($P<0.01$); while female's scores from the after fourth stroke constitute obviously higher proportion than the male's ($P<0.01$). No difference is found between their scores in the third stroke. The male's lost scores in receive, the third stroke ($P<0.01$) and the fourth stroke ($P<0.05$) is proportionally much higher than female's lost scores in these strokes. However, the female's lost scores in the after fourth stroke is significantly higher in proportion than male's lost scores in the same stroke ($P<0.01$). No difference is found in proportion between male and female's lost scores in serve.

3.3. In table tennis matches, the third stroke has the maximal effectiveness, followed successively by receive, the fourth stroke and after fourth strokes. Among them, male players are significantly more effective in the third stroke and receive than females ($P<0.05$, $P<0.01$). No difference is found in their technical effectiveness in the fourth stroke and after fourth strokes. Since there are a lot of peculiarities in serve, the present research doesn't calculate its technique effectiveness. 3.4 In the male's matches, the technique effectiveness of the after fourth strokes is most correlated with the competition performance ($r=0.826$, $P<0.01$), followed first by the third stroke ($r=0.582$, $P<0.01$), then by the fourth stroke ($r=0.521$, $P<0.01$) and lastly by receive ($r=0.339$, $P<0.01$). In the female's matches, the technique effectiveness of the after fourth strokes is also more correlated with the competition performance ($r=0.846$, $P<0.01$), then followed by the fourth stroke ($r=0.565$, $P<0.01$), the third stroke ($r=0.539$, $P<0.01$) and lastly by receive ($r=0.489$, $P<0.01$).   **Conclusions.** In table tennis matches, male and female players differ very much in technique usages. Male players show outstanding technique usage in serve, receive and the fourth stroke, while female players rely more on the after fourth strokes. But they show no clear technical differences in the third stroke. However, the effectiveness of the after fourth strokes is always mostly correlated with the competition performance, no matter for the male or female players.

Keywords: *technique effectiveness, competition performance, elite players*

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SYSTEMATIC ANALYSIS OF TECHNIQUES AND TACTICS OF TABLE TENNIS IN CHINA

Abstract

Techniques and tactics are critical winning factors in table tennis matches. Therefore, theories and practices in table tennis technique and tactic analysis have long received high priority from coaches, players and researchers in China. The present paper aims to conduct a general sum up of the technique and tactic analysis of the China national table tennis teams in preparation for the Olympic Games and world championships in recent years.

(1) Table tennis technique and tactic analysis can be classified into narrow and broad analysis. An analysis in a narrow sense includes the analysis of the usage of different types of techniques and tactics; while that in a broad sense also includes the analysis of scores, situation changes of matches and player performance during the competition as well.

(2) A systematical technique and tactic analysis consists of description statistics, technique evaluation, model diagnosis and simulation four sections.

(3) No matter what kind of computation formula is used, the scoring rate and usage rate are always the core indices in table tennis technique and tactic analysis. And other indices are all derived from these two. A great amount of researches so far have revealed that using the sequential striking order in the competition, such as the first/third strokes, second/fourth strokes, and after fourth strokes as indices for analysis, calculating their scoring rate, usage rate and technique effectiveness respectively, establishing evaluation criteria and then conducting simulation can effectively demonstrate the technique and tactic features of table tennis players.

(4) Table tennis tactics is consistent in time and coherent in space. Therefore, data mining (association analysis) can effectively make explicit of the implicit player technique and tactic features. The technique and tactic data mining analysis in table tennis can be grouped into two kinds: forward data mining and backward data mining.

(5) Markov chains and neural network model can be used to perfectly conduct technique and tactic simulation diagnosis or prognosis analysis for table tennis competitions.

Keywords: *table tennis, technical and tactical analysis, China*

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STUDY ON THE ILLEGAL SERVICE OF CHINESE AND FOREIGN TABLE TENNIS PLAYERS

Abstract

1. Introduction

The rate of the judgment on Chinese table tennis players' illegal service was on the rise in the international table tennis matches these years. Once a service was judged fault, it would influence on the athlete's mental state and the tactics, and even lead to lose the game. The purpose of this study is to cause the Chinese coaches and athletes attention, and to do the corresponding training.

2. Method

By the method of building up two-dimensional rectangular coordinate system in the screen shots of video, locating the ball in the two-dimensional rectangular coordinate system, the service skills of Chinese and foreign athletes were analyzed, mainly from the three aspects, the angle of throwing, the height of throwing and sheltered service. The subjects were 5 male Chinese players (Zhang Jike, Wang Hao, Ma Lin, etc.), 5 female Chinese players (Li Xiaoxia, Ding Ning, Guo Yue and so on), 10 foreign male athletes (Boll, Ryu Seung-Min, Jun Mizutani etc.), and 6 foreign female players (Feng Tianwei, Ai Fukuhara, Tie Yana etc.).

3. Results and Conclusions

First, the services of Chinese and foreign players were illegal service to a certain degree. The ball was not thrown upwards vertically. And the ball was sheltered by the body of the players. Second, service can start with the ball resting freely on the open palm of the server's stationary free hand. Third, all the athletes can reach the required throwing height. Fourth, the angle of common service was smaller than that of high toss service. Fifth, the sheltered service in female athletes is mainly in the front-rear direction of the body. Sixth, the sheltered service in male athletes is mainly in the vertical direction of the body.

Keywords: *service, illegal, drop angle, drop height, keep out*

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## EVALUATION OF SKILLS AND TACTICS BASED ON TOPSIS IN TABLE TENNIS

Abstract

The authors collect Zhang Jike's 14 maches's data (score rate and loss rate of 1st, 2nd, 3rd, 4th, >4bat), using the TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) evaluation method to calculate the differences among these matches. According to the diagram 1, before 2011 championships his competition quality was stable, basically maintained at about 0.3. But since the 2011world championship begins, it has risen to more than 0.5 when he competed with Joo Saehyuk, reaching the summit. In the following match, his match quality of match with Boll also rises to more than 0.4, pass this hard fighting, its ability that defeats the foreign player in important match is stressed very much.

Table 1 Information and result of matches

ID	ZHANG Jike's matches	Score	Rank
1	2010 Qatar Tournament vs. WANG Liqin	1:4	13
2	2010 China Cival Match vs. MA Long	3:2	12
3	2010 Moscow World Championships vs. Seiya KISHIKAWA	3:1	5
4	2010 Moscow World Championships vs. Christian SUSS	3:1	7
5	2010 World Cup Final vs. WANG Hao	1:4	9
6	2011 China Cival Match vs. MA Lin	4:3	8
7	2011 Qatar Tournament vs. Jun MIZUTANI	4:2	14
8	2011 China Tournament vs. ZHANG Yu	4:3	6
9	2011 Austria Tournament vs. MA Long	3:4	3
10	2011 China Tournament vs. MA Long	2:4	11
11	2011 Rotterdam World Championships vs. JOO Saehyuk	4:0	1
12	2011 Rotterdam World Championships vs. WANG Liqin	4:2	10
13	2011 Rotterdam World Championships vs. Timo BOLL	4:1	2
14	2011 Rotterdam World Championships vs. WANG Hao	4:2	4

Diagram 1 Rank of Matches
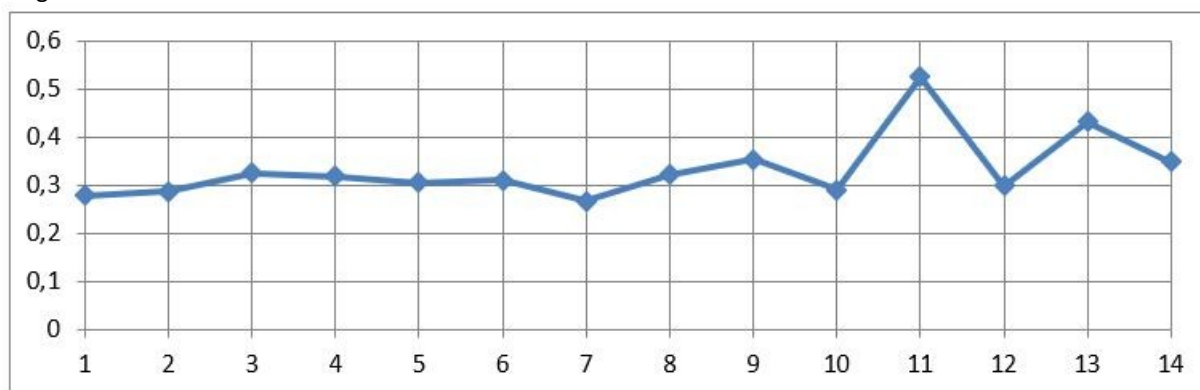
Keywords: *table tennis, evaluation, skills tactics, TOPSIS*