

**Japan Table Tennis Association
Sports Science and Medicine Committee
International Meeting 2015**

**PROGRAMME
AND
ABSTRACTS**



**20 - 21 September 2015,
National Training Center,
Tokyo, JAPAN**



スポーツ振興くじ助成事業

Supported by Sports Promotion Lottery

Japan Table Tennis Association Presidents Greetings

I am pleased to announce the holding of “2015 JTTA SSMC International Meeting” at National Training Center, Akabane Tokyo from 20th to 21st September, 2015. Following the meeting held the year before, we have participants from ITTF SSMC and other International SSMC members joining us.

Sports Science & Medicine Committee (SSMC) was set up in 1987, by JTTA to introduce SSMC into strengthening of players. There are 27 members within the committee and they all work in different fields such as Doctors, Nutritionist, Psychological Researcher, Trainer, Sports Scientists Researcher, and Engineering Researcher. These members worked on the basic research (Practical and Theoretical) on Table Tennis to build the Medical Support, Mental Support, Nutritional Support, and Information Strategy.

Since 1990, researcher’s got together once a year, bringing their research to share, discuss and evaluate for further development.

The meeting which has its history became an International Meeting for its first time last year when ITTF SSMC members who were in Japan at the time for the “World Team Table Tennis Championships in Tokyo”.

We would like to share the conclusion of our research with everyone around the world and to have discussion on it.

I am delighted for such International Meeting to be held here in Tokyo, where the future Olympic and Paralympic Games will be held. I wish this meeting will be fruitful for all participants.

Japan Table Tennis Association

President

Sadayoshi FUJISHIGE

Greetings

I am pleased that we can hold this annual meeting again in 2015. Thank you for your attendance.

It has great significance to us to hold this meeting again in Tokyo. Last year, We, the JTTA sports science and medicine committee, decided to open our annual meeting to researchers from other fields, and also to invite the members of the ITTF sports science and medical committee. We had our first international meeting at the same place last year and it was extremely productive and beneficial.

It has great value to hold a 2nd international meeting. We often see that plans are carried out only once and are not continued. However, today we are having our 2nd meeting. Continuation is vital.

We have been conducting this meeting for over ten years domestically. Each researcher is an authority in their field, and so we have confidence in our research. I am sure that publishing our research results is helpful not only for domestic researchers but also for the researchers in foreign countries. I hope we will leave this meeting with new knowledge, new skills, new expertise and a network of new friends and colleagues.

Finally, I would like to emphasize once again, we have a long journey ahead of us before we will see any concrete results. I will make the utmost effort for the continuation of this meeting in years to come.

Japan Table Tennis Association
Sports Science and Medicine Committee Chairman

Shiro MATSUO

Organizing Committee

Shiro MATSUO (Bessho Medical Clinic, JTTA SSMC)
Kazuto YOSHIDA (Shizuoka University, JTTA SSMC)
Hiroyoshi OGASA (Yamaguchi University, JTTA SSMC)
Koshi YAMADA (Table Tennis Friendship Club, JTTA SSMC)
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Kazuhide OGINO	Doping Control Committee
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Osei TSUJI	
Hiroyasu AKAGI	

PROGRAMME

Welcome

Sun. 20 September 1:00 pm-

Shiro MATSUO The chairman of JTTA sports science and medicine committee

Research presentations & Activity reports

Session 1: Research presentations

Sun. 20 September 1:00 pm-

Chair: Shiro MATSUO

- 1. Rapid adjustment of swing immediately before hitting in table tennis players**
Kazuto YOSHIDA (Shizuoka University, JTTA SSMC)
- 2. Assessment of table tennis strokes using inertial sensors**
Yoichi IINO (The University of Tokyo, JTTA SSMC)
- 3. Muscles of the legs fatigue analysis about forehand stroke in table tennis**
Mai KITAMURA (Graduate School of Modern Society and Culture, Niigata University)
- 4. The importance of orientation and initial selection pattern for table tennis**
Nicolae Ochiana Phd (University Vasile Alecsandri of Bacau, Romania, ITTF SSMC)
- 5. Profiling international elite youth table tennis players using a multidimensional approach**
Irene R. Faber (The Netherlands, ITTF SSMC)

Session 2: Research presentations

Sun. 20 September 3:00 pm –

Chair: Kazuto YOSHIDA

6. Rally Length in Top Level Table Tennis

Michael Fuchs (Performance Analysis and Sport Informatics, Technische Universität München, Germany)

7. Determining the overall structure and the role of technical - tactical activities in modern, competitive level table tennis game (by using two different approaches/methods of collecting data)

Goran Munivrana, PhD (ITTF SSMC)

8. Development of a Web-based Application for Performance Analysis in Table Tennis

Sho TAMAKI (Meio University, JTTA SSMC)

9. A 3D Simulation of the Flight of the Table Tennis Ball (2)

Suguru ARAKI (Department of Information Science Tohoku Fukushi University)

10. The research of responses of cardio-respiratory functions by many ball practices in table tennis.

Junichi KASAI (Waseda University, JTTA SSMC)

Special Program

Sun. 20 September 5:00 pm –

Chair: Chikara Miyaji (Department of Sports Science, Japan Institute of Sports Science)

1. Special lecture

High-speed Image Processing and Its Applications in Sports Science

Masatoshi ISHIKAWA (The University of Tokyo)

2. Explanation of the project

Developing an immediate feedback system on ball rotation speed in table tennis

Chikara MIYAJI (Department of Sports Science, Japan Institute of Sports Science)

3. Demonstration

Demonstration of high-speed tracking photography

4. Q&A

Key note lecture

Mon. 21 September 9:00 am –

Health status and incidences of injuries in para table tennis related to the substance misuse

Miran Kondric, PhD

(Chairman of ITTF Sports Science and Medical Committee)

Research presentations & Activity reports

Session 3: Activity reports & Research presentations

Mon. 21 September 9:45 am –

Chair: Shiro MATSUO

11. Food environments in ITTF premium junior circuit

Michiyo KIMURA (Takasaki University of Health and Welfare, JTTA SSMC)

12. The Appropriate Pharmacotherapeutics and the Role of Pharmacist in Sports

Takuro OKADA (Kameda Medical Center, JTTA Doping Control Committee)

13. Introduction of the so-called “Baseball Elbow” in Japanese Adolescent Table Tennis Players

Hiroyoshi OGASA (Yamaguchi University, JTTA SSMC)

Session 4: Activity reports & Research presentations

Mon. 21 September 10:45 am –

Chair: Hiroshi SEKIYA (Hiroshima University)

14. Mental support to the table tennis youth national team

Yoji YOSHIZAWA (Nagoya University of Economics, JTTA SSMC)

15. Establishing Reliability of the Competitive Readiness Scale for Table Tennis Athletes (CRSTTA)

Arnulfo Lopez (Graduate School of Psychology University Of Santo Tomas, Philippines)

Oscar Yoshihiro Santelices (Department of Sports Science, College of Human Kinetics, University of the Philippines, Philippines)

16. A multidisciplinary investigation of the effects of state anxiety on serve kinematics in table tennis

Young Ngo (Glasgow University, Scotland)

17. The importance of pre-performance ritual and rituals between points (The Game Face Routine)

Dora Kurimay (ITTF SSMC)

18. A qualitative study on the factors for watching table tennis game

Yu-Ling Lee, Tsung-Min Hung (National Taiwan Normal University, ITTF SSMC)

Closing Remarks

1:00 pm

Jean-François Kahn (ITTF SSMC special adviser)

Key Note Lecture

Health status and incidences of injuries in para table tennis related to the substance misuse

Prof.Miran Kondric, PhD

Chairman of ITTF Sports Science and Medical Committee

In order to improve health status in table tennis and gain a better picture of incidences of injuries related to table tennis, we wish to examine some factors which could be important for sports results such as smoking, alcohol, narcotic drugs and doping agents among active sportsmen in para table tennis.

Scientists worldwide say the findings show that as physical activity is increasingly promoted as a critical part of a healthy lifestyle, sports injuries are becoming an important health issue for both children and adults. For effective prevention in table tennis players with disability, it is important to understand the functional anatomy and patho-physiology of injuries of different tissues but also the factors listed above. As a result, injury prevention efforts need to go beyond targeting children and start addressing the risks faced by physically active para table tennis players as well. Fortunately, most sports injuries can be treated effectively, and most people who suffer injuries can return to a satisfying level of physical activity after an injury. Even better, many sports injuries can be prevented if people take proper precautions.

When all factors, including nutritional supplementation, fail to provide the result athletes are striving for, the temptation to start doping emerges. In its most common sense, doping is defined as the occurrence of one or more anti-doping code violations, mostly observable in the presence of a prohibited substance or its metabolites or markers in an athlete's specimens (WADA). The results presented so far allow a broad discussion of the findings. The incidence of injury levels needs to be reduced and it can be achieved by concentrating more on preventative measures. Therefore, in order to prevent doping behaviour and injuries in para table tennis we strongly suggest intensive educational programs on sports nutrition and doping-related problems. Nutrition cannot replace an athlete's genetic potential, training regime or overall psychosocial preparation, but the most favourable nutritional strategies have been studied and have often proved beneficial. In short, optimal nutrition can reduce fatigue and injuries, promote recovery from injuries, optimize the human body's energy stores, and directly influence athletes' health status.

Special Program

High-speed Image Processing and Its Applications in Sports Science

Masatoshi Ishikawa (The University of Tokyo)

We developed high-speed image processing at 1,000 frames per second and applied the technology to various research and engineering fields including sports science. In my talk, after the technology and some applications in engineering field will be briefly explained, applications in table tennis including high speed ping-pong ball tracking using 1ms auto pan/tilt system, vibration measurement of ping-pong ball and racket in play, dynamic projection mapping on a moving ball, and aerial display system with high speed gesture and motion capture. Since the 1ms auto pan/tilt system implements high-speed image processing for getting a position of a high-speed moving object at 1,000fps and two galvano mirrors for tracking by controlling an optical axis using the target position data, it can track a moving object at several hundred km/h and take a HD or high speed video simultaneously. Its system architecture, tracking method, and realized performance will be shown. In addition, baseball robots for throwing, tracking, hitting, running, and catching will be shown as a sample of sports playing robot.

Developing an immediate feedback system on ball rotation speed in table tennis

Chikara Miyaji^{*)}, Yuki Inaba^{*)}, Hiromasa Oku^{**)},
Takanori Abe^{**)}, Katsutoshi Saito^{***)} and Kazuto Yoshida^{****)}

Quick feedback about a multitude of parameters of athletic performance is crucial to improving skills. While coaches have performed this role it would be useful to have a monitoring system independently capture and analyze data for rapid analysis and feedback. In table tennis it is essential to obtain feedback on ball speed and rotation speed to improve skill. We intend to develop a video processing system to capture ball rotation speed in training situations.

In order to capture ball rotation by high-speed camera two contradictory conditions must be satisfied. (1) The camera should have narrow angle as possible to get the ball image clear and larger, (2) The camera should have wide angle as possible to catch the high speed flying ball in the image. We solve this problem using the camera with "1ms Auto Pan-Tilt" technology developed by Ishikawa-OKu lab. Using this camera system we can get clear ball images while the ball is in flight and calculate the ball rotation speed in very short time using an image-processing program. This system will get the ball rotation speed just after the player strikes the ball.

While at this stage of development we do not yet have a suitable way of returning the information to a player during a rally, we expect the system will be very useful for the players to evaluate their skills during training.

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[1]

Rapid adjustment of swing immediately before hitting in table tennis players

Kazuto YOSHIDA (Shizuoka University, JTTA SSMC), Koji SUGIYAMA (Shizuoka University), Shin MURAKOSHI (Shizuoka University), Koshi YAMADA (Table Tennis Friendship Club, JTTA SSMC), Sho TAMAKI (Meio University, JTTA SSMC)

In our questionnaire, about 90% of table tennis players answered that they had experienced adjusting their racket movement for an irregularly bouncing ball, e.g. the ball rebounded at the edge of the table, immediately before hitting in matches. The purpose of this study was to investigate the rapid adjustment of forehand topspin stroke in table tennis players through an experiment.

Three table tennis players participated as subjects in the experiment. Two conditions, regular bound and irregular bound, were examined. Official balls were used in the regular bound condition and balls whose surface had been made uneven to cause irregular bounds were used in the irregular bound condition. The subjects were informed which ball would be used before each trial. In the trials, the subjects returned balls, which were delivered by a tosser, with powerful forehand topspin strokes. The delivered balls were controlled to land in a circle of 20cm radius on the right half court of the receiver. The center of this circle was 90cm from the net and 40cm from the sideline. In the irregular bound condition, the subjects were asked about their introspection on racket control after every hitting. The trials were filmed at 250 fps. Muscular activities of the upper limb were recorded at 1000 Hz. The following muscular activities were measured: extensor carpi ulnaris, extensor digitorum communis, extensor carpi radialis longus and brevis, flexor carpi radialis, and pronator teres. Muscular electrical discharge was measured by a surface dipole dielectric method. Acceleration sensors were installed on the table and racket. The accelerations were recorded at 1000 Hz to detect the moment of bouncing.

Under the irregular bound condition, several types of rapid adjustment of forehand topspin stroke were observed. In most cases, they made their impact time later than those in the regular bound condition. By comparing the electrical discharge of M. extensor carpi ulnaris between the two conditions, it was suggested that rapid adjustments in the muscular activities started after from 120 to 150ms of the irregular bound.

*This work was partially supported by JSPS KAKENHI Grant Number 18500474.

Assessment of table tennis strokes using inertial sensors

Yoichi Iino

1. Introduction

Inertial sensors are sensors based on inertia and generally refer to accelerometers and gyroscopes. Motion analysis using the sensors has advantages in terms of cost and portability compared to a motion capture system. However, the application in table tennis has been limited (Boyer, 2013). The purpose of this study was to assess table tennis strokes using three inertial sensors attached to the pelvis, upper trunk and racket and compare results with those obtained using a motion capture system.

2. Methods

Two male table tennis players participated in this study. They are collegiate Division III players with training experience of 6 and 7 years. They provided written informed consent and the experimental procedure was approved by the local ethics committee.

The participants were asked to hit 10 consecutive topspin forehand drives against topspin balls projected by a ball machine. Three 9-dof wireless inertial sensors (LP-WS1103, Logical Product) with a mass of 30 g were attached to the racket (Figure 1), the upper trunk, and the pelvis of the participants. Three reflective markers were attached to each of the trunk inertial sensors and racket. The sensor data were recorded at 1000 Hz. The marker coordinates were determined at 200 Hz using a motion capture system (MAC 3D system, Motion Analysis) with electrically synchronized with sensor data.

The data from inertial sensors were smoothed using a Butterworth low-pass digital filter with a 20 Hz cut-off frequency. The coordinates of the markers were also smoothed using the filter with the cut-off frequencies that were determined with a residual analysis.



Figure 1. Racket and an attached inertial sensor

3. Results and Discussion

Overall, the time-curves for acceleration and angular velocity of the racket, upper trunk, and pelvis obtained from the inertial sensors were similar to those obtained from the motion capture system. The differences in peak angular velocities of the upper trunk and pelvis between the two methods were generally below 5% of their peak values. The results suggest that the racket and trunk angular velocity and acceleration can be obtained using inertial sensors with a similar level of validity to a motion capture system.

References

[1] Boyer, E., Bevilacqua, F., Phal, F. and Hanneton, S. (2013) Low-cost motion sensing of table tennis players for real time feedback. *International Journal of Table Tennis*, 8, 1-4.

[3]

Muscles of the legs fatigue analysis about forehand stroke in table tennis

Mai Kitamura¹, Yukihiro Ushiyama², Kei Kamijima³, Masahiro Tamura⁴

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Table tennis is almost individual competitions, and players do many games to win the title. Playing many games need physical strength, especially stamina. In table tennis, there are many play style, like a Drive-man, an Attacker, and a Chopper. Moreover table tennis trainings are classified into the using a ball and using many balls, and there are countless combinations about training are based on skills. It's important the training suit an individual. But in practice, almost players do same training regardless player's characteristics, their play styles and their levels in field of coaching about table tennis. We analyze muscles of the leg in order to know their fatigue, utilize the results, finding player's characteristics, and to be in effect training suit an individual.

The subjects belong to table tennis club of Niigata University. (n=10, average \pm S.D., height 172.8 ± 6.0 , weight 61.1 ± 5.8 , experience 10.2 ± 3.6) They are all right-hander and they use pimples-in rubber on face of forehand. The electrodes were put on subject's biceps femoris muscles, vastus medialis muscles, and gastrocnemius muscles. The subjects wore goniometer to pick out a stroke with angle of elbow. Then, they did a stroke for a second and it continued for three minutes on trial. After taking a 15-minutes break, they did a trial again. Extracted electromyogram (EMG) was done fourier transform by the program was made with MATLAB2010a (produced by Math Works) on condition of sampling frequency 1000 Hz, section length 500msec, and shift length 20msec. We got Mean Power Frequency (MPF) to know information about frequency of muscle, and Average Rectified Value (ARV) to estimate muscle activities. Moving average was got to find tendency easily, and it was 10 seconds interval and move by 5 seconds.

In MPF, all cases were decreasing, and trial 2 was larger decreasing. Especially, 30-50seconds after the beginning the trial showed much decrease. There was fast-twitch fibers have high frequency activities decreased. In trial 2, it thinks muscle fatigue was accumulated. Comparing the three muscles, biceps femoris muscles showed most small fall. It guesses gastrocnemius muscles and vastus medialis muscles were more used in stroke. In ARV, there are two types, decreasing and increasing with time course. It thinks how to stroke and using muscle was different each subjects. In trial 2, ARV was decreasing in the fast, and increasing in the later. A part of decreasing was same part of especially decreasing in MPF. It guesses decrease of fast-twitch activities caused such a result. There are individual differences in muscle fatigue. To make use of players, it needs to study muscle fatigue about the arms and the trunk together. Also, we should perform physical performance test like a using exercise bike before study, and should consider about players in many directions.

THE IMPORTANCE OF ORIENTATION AND INITIAL SELECTION PATTERN FOR TABLE TENNIS

Nicolae Ochiana Phd,

University Vasile Alecsandri of Bacau, Romania

Orientation and selection in sports are two distinct processes that many authors mention among the factors favoring the performance capacity. The orientation and the selection for the sports activity are very important and up-to-date, high performance being achieved only by the ones who have special abilities and who also benefit from favorable conditions to develop them.

The purpose of the scientific investigations was the identification of abilities favoring the practice of table tennis, abilities proved at an early age, as well as their gathering into an initial selection pattern which should serve as a work tool for the coaches and teachers who deal with these problems.

Hypotheses of the research: although the orientation and the initial selection are different processes, we still consider that they may be served by a common operational tool (pattern) in the building of which hereditary favoring qualities and abilities are mostly involved, abilities which can be less improved later, during the training process

The objectives of the research:

Conclusions:

1. The bibliographical study has emphasized the fact that there is a conceptual aspect of the two processes, namely the orientation and the initial selection, but they have a slight practical operational character in the process of gradual evolution of the performance sportsmen in table tennis, and they are not enough applied according to scientific criteria;

2. The old didactic stages of selection (primary – secondary – final) are outdated, the promotion and the practical use of the selection patterns on formative levels being necessary; this has more advantages, among which we can mention the rigorous quality of “sifting” the whole population of pre-school and early school age in order to choose the subjects endowed for table tennis;

3. The orientation and the selection on *formative levels* is in fact a *continuous process, not a series of momentary actions or steps*.

4. The lack of a unique, centralized system of orientation and initial selection which could ensure the improvement of the two processes on national level.

5. The orientation and initial selection pattern in table tennis, which was made up after studying the specialized bibliography, adding the results of the inquiry and the personal experience, has led to the structuring of the abilities favoring the practice of table tennis into 8 modules: module A- the anthropometric pattern; module B- the functional pattern; module C- the kinetic pattern; module D- the psycho-motion pattern; module E- the psycho-intellectual pattern; module F- the psycho-adjusting pattern; module G- the indexes of the anthro-physiometric pattern; module H- the specific motion abilities.

6. The information gathered from the practical use of the orientation and initial selection pattern can be considered as reference data; however, the values reached can only be considered as guiding values, the experiment being carried out on a school level.

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Profiling international elite youth table tennis players using a multidimensional approach.

Irene R. Faber, The Netherlands

Table tennis is a popular sport all around the world, but especially in Asia and Europe. Although no exact up-to-date statistics are available, it was estimated in 1995 that almost 300 million people play table tennis worldwide (Sklorz & Michaelis, 1995), including 40 million competitive table tennis players (<http://www.olympic.org/table-tennis>). Table tennis is an international, socially attractive sport, relatively cheap, practicable for players of all ages and easily accessible to many people. Although table tennis is practiced in many countries, China appears to have a monopoly on winning gold medals in world-level competition (<http://www.ittf.com>). Even in Europe, female athletes of Chinese origin dominate the top 10 ranking (<http://www.ettu.org/>; Heller, 2008). The sport's future global 'health' or existence might be violated by a domination of one country. A more diverse distribution of success probably provides a broader support for table tennis worldwide. Moreover, triumphs in sports can positively contribute to a nation's political and economical position, health status and well-being as successful elite players serve as a nation's representatives and as role-models for fellow citizens.

If countries in Europe or other continents want to be serious competitors at international table tennis events with native players, changes in policies and educational programmes seem inevitable. Additionally, only relying on deliberate practice (Ericsson, Krampe, & Tesch-Römer, 1993) for winning medals at world championships or the Olympic games seems outdated as training programmes in table tennis have been maximized and the sport has become highly professionalized. Identifying the true 'high potentials' seems vital for many associations to compete at the highest level due to the relatively small numbers of table tennis players and low budget. Wrong choices in selecting youth players for the association's talent development programme and national teams will lead to failure and is a waste of time and of financial resources. Accurate selections of youth players already at a young age depend on the adequate evaluation of the potential of a child. Moreover, monitoring the development of players in the context of international elite performance seems sensible for optimal guidance during training. As table tennis on world-class level is recognised to be depending on various factors, a multidimensional approach seems appropriate. Consequently, talent development programmes might benefit from profiling international elite performance in youth table tennis players using a multidimensional approach (Elferink-Gemser, Jordet, Coelho E Silva, & Visscher et al., 2011; Faber, Bustin, Oosterveld, Elferink-Gemser, & Nijhuis, 2015; Faber, Oosterveld, Van den Heuvel, Bustin, Elferink-Gemser, & Nijhuis-Van der Sanden, *submitted for publication*).

Consequently, a research proposal will be presented to gain multidimensional international profiles of elite youth players, girls and boys, at different ages (U13, U15, U18, U21). Besides the multidimensional approach the possible confounding effect of variation in growth and biological maturation (Coelho E Silva, et al., 2010; Malina, Cummings, Morano, Barron, & Miller, 2005) and the possible relative age effect in youth national selection will be taken into account.

Rally Length in Top Level Table Tennis

Michael Fuchs, Martin Lames

Chair for Performance Analysis and Sport Informatics, Technische Universität München, Germany

Keywords: Table tennis, real-time match observation, rally length

Abstract:

Problem: Typical interaction in net/wall games is alternating strokes in a rally, resulting in point for player A or B. Each stroke may mean the end of a rally, either as winner or error. Furthermore, each stroke in table tennis rallies has specific tactical meanings and options e.g. the second stroke (return) has to deal with quality of service and to give a response ideally in creating an advantage. Therefore rally length and success/failure rates of different strokes are of particular interest in studying the structure of table tennis (Zhang, Liu, Hu & Liu, 2013).

Method: The sample consisted of 105 women's and 154 men's singles matches. The matches were chosen from final stages of world table tennis top events. Data of 97 matches were available from previous studies carried out by the Technische Universität München in cooperation with the Shanghai University of Sports. The remaining matches were available as video on demand either on the channels of the International Table Tennis Federation or the European Table Tennis Union. The data on rally length were collected by a recently developed match analysis software for real-time match analysis in table tennis. Impact of playing style, ball type, sex and ranking on rally length was statistically analysed.

Results: Because of a significantly higher rally length, matches with a defensive player were excluded. For further analyses only matches with two offensive players were considered. Whereas there were no differences in rally length in matches between different performance levels of male athletes ($F=0,906$, $p=0,479$, $\eta^2=0,032$) there were significant differences in female athletes ($F=3,811$, $p=0,004$, $\eta^2=0,203$). We also found a significantly higher rally length in female compared to male table tennis. This difference is mostly due to differences between the sexes in matches of top class players, e.g. top class vs. top class: mean male=4,73, mean female=5,79, $t=4,112$, $p=0,002$. In matches between lower ranked athletes there were no significant differences.

Conclusion: Rally length is a first and crude variable to characterize table tennis matches. We found several characteristic relationships to start from in further studies.

Reference:

Zhang, H., Liu, W., Hu, J.-J., & Liu, R.-Z. (13. 05 2013). Evaluation of elite table tennis players' technique effectiveness. *Journal of Sports Sciences*, 32 (1), S. 70-77

Determining the overall structure and the role of technical - tactical activities in modern, competitive level table tennis game (by using two different approaches/methods of collecting data)

Goran Munivrana, PhD

Table tennis is considered to be one of the most demanding sports games when viewed in terms of its structural complexity in comparison with other sports disciplines. It is technically and tactically an extremely complex sport because it demands a wide range of different playing techniques which, among other things, depend on the material (type of rubber) with which a stroke is made, and the type of stroke made by the opponent. Therefore, as the technical-tactical abilities are one of key factors for achieving success in table tennis game, studies of players' technical-tactical activities assume a key role in the analysis of players' match performances.

When seeking to establish the overall group of technical-tactical activities used in table tennis and scientifically analyze their role in modern table tennis game one of the main issues is choosing the most appropriate method of collecting the data.

In the previously conducted research studies on the technical-tactical characteristics of table tennis, the data have been primarily collected by means of video analyses of table tennis matches, in which different types of players' technical-tactical activities in matches have been analyzed and their role evaluated (*Djokić, 2001, 2007; Galina, 1992; Guan et al., 2011; Pfeifer et al., 2010; Pradas et al., Wang et al., 2009 2010; Yu et al., 2008; Zhao et al., 2007; Zhe et al., 2007, 2010; ect.*). Although the method of collecting technical-tactical data by means of video analyses of table tennis matches is quite valid and objective, there are few "obstacles" which needs to be taken into account when using the method with the aim to establish the overall group of technical-tactical activities used in table tennis; The first one is that there are always two opponents (or teams) confronting each other (like in all sports games) and the data obtained from the observed matches also depend directly on the quality of the opponent and its playing style. So, it would be important to ensure that players with different styles (systems) of play meet and play with different materials (rubbers) so as to enable all table tennis techniques/activities to appear in the sample in order for them to be adequately evaluated; The second one is that a single match only generates a limited amount of information and the data obtained merely represent a partial or relative value in the observed matches. So it would be necessary to analyze a huge sample of matches, point by point, and note every technique performed, whilst even then it is still uncertain that it would be possible to fully cover the entire group of technical-tactical activities which can occur in table tennis game.

The other possible approach for collecting data on technical-tactical activities in table tennis is by using expert analysis as the data collection method. This method has been well-established in numerous sports' studies, but has never been used in order to analyze technical-tactical activities in table tennis, until just recently (Munivrana, Furjan-Mandić and Kondrič, 2015). The method used in the study, has been shown to be very reliable as the experts, which were chosen amongst world class coaches, have shown to be highly objective in determining and evaluating overall group of technical-tactical activities that can be used in table tennis. The main advantage of the method is that it facilitate collection of the overall data and it is potentially more comprehensive of the two. The main disadvantage is that it is based on empirical (subjective) data, so it is necessary for experts to show a high level of agreeing in evaluating technical-tactical activities for results to be validated.

Consequently, a research proposal will be presented with aim to evaluate and compare advantages and flaws of the two methods and combine them, by using the best features of the both, in order to obtain the most objective image of the real value of all technical-tactical activities used in a table tennis game.

Development of a Web-based Application for Performance Analysis in Table Tennis

Sho Tamaki, Kazuto Yoshida, Koshi Yamada

1. Introduction

We already had developed some computer programs for performance analysis in table tennis. In 2012, we developed Windows application to analyze table tennis matches more easily and more immediately, which was used in London Olympics. In 2013, we developed a server-side program as a first step to share an analysis method with everyone who loves table tennis. This program was a Data-Base Management System, which used Google OpenID for the authentication, and Google App Engine and Big Table for the management of analysis data.

As a next step, we added the new function to the server-side program and developed a client-side program. In the following of this paper, we report the achievements and future tasks of this research.

2. Outline of the achievements

2.1. Server-side development

The server-side program developed the last year only received a set of all data stored in client program, namely only full backup was available with that one. Any client program, therefore, was forced to be implemented an inefficient backup function, backup was executed at regular time intervals, not right after the inputs. We added functions which creates, refers, updates, and deletes a specific kind of data, e.g. competition, round, team, athlete, match or rally. This function makes it possible to develop a client program which has a more efficient and useful backup, namely immediate differential backup.

2.2. Client-side development

The challenge of the development of client-side program is to consider and solve the problem with an existing web-based application, which had already been developed in another project. The biggest problem was the inability of an immediate data input due to the screen transition when we input the information of a rally. In order to solve the problem, we redesigned the input screen, removed some controls and added the function of them into score-board control, and united two screens. Now, real-time data input has been realized with that modification.

3. Future tasks

At first, we need to combine the two programs, server-side one and the client-side one. The two developments were conducted independently in this research. It took a so long time to develop the client-side program and the combining wasn't achieved. We think it's the most important task in this research. Next, the screen design of client-side program should be modified to improve the usability. Currently, some inefficient processes are required to the user. We will solve the problems to release this web-based application as soon as possible.

Acknowledgments

We would like to express our gratitude to Yasuhisa Okazaki and Masahiro Yoshiura, Saga University, for their contribution in the development of the client-side program.

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A 3D Simulation of the Flight of the Table Tennis Ball (2)

Suguru Araki

A new method of simulating the flight of the table tennis ball under the influence of the Earth's gravity, the air drag, and the lift generated by its spin has been proposed (Araki and Wada 2014). In this second project of a series I apply the above method to present a detailed simulation of the net cord services and edge balls (11.2, 12.2 Handbook for Match Officials 15th ed. 2014).

[10]

The research of responses of cardio-respiratory functions by many ball practices in table tennis

Junichi Kasai (Waseda university. JAPAN)

Purpose

The physical fitness is very important. The player must hit the power ball in modern table tennis. Indeed, top player in Japan, to make the spin of the ball to the energy which raise the dumbbells about 20 kg and is said to be consumed.

In addition, the ball speed is 126 km per hour and the rotation of the ball is 125 per hour, it has been reported.

Anaerobic severe exercises of about 4 second in table tennis game are repeated. Table tennis player is required high level power and endurance.

In this study, a multi ball exercise method is used. The player moved during foot work exercises for one minute. Used strokes of hitting the ball is the forehand smash.

The level of oxygen consumption and heart rate were measured for evaluation for performance.

Methods

The subject is 4 male players belonging to the waseda university table tennis club.

Subjects A ranked 22 in all over the world ranking. All members participated in the all japan championships.

To measure oxygen consumption and heart rate, instrument k4b2 was used. After resting for a few minutes, the player moves to the left and right alternately. And, the player hit the ball 60 times by forehand smash strokes for 1 minute. Immediately after the exercises, oxygen consumption and heart rate are recorded by the heart rate to return to resting level.

Result & discussion

All subjects showed the highest the value in heart rate (b/m) showed immediately after 1 minute. Subject A and B and C showed the highest value in oxygen consumption (ml/kg/m) immediately after 1 minute. On the other hand, subject D did not show the highest value in oxygen consumption (ml/kg/m) immediately after 1 minute.

From these results, A and B and C could hitting the ball during 1 minute for the supply of oxygen sufficiently. Subject A showed 109 (b/m) of the heart rate at 80 seconds after maximal effort. These result shows that the value of oxygen consumption and heart rate will became better index of good player.

Food environments in ITTF premium junior circuit

Michiyo Kimura (Takasaki University of Health and Welfare)

Mizuho Adachi (Nippon Sport Science University)

Background and purpose

Junior table tennis players usually have to repeat several matches in a day in ITTF premium junior circuit and compete late into the night. However, they are still in the stage of growth and development and are required to have adequate nourishment and rest. The purpose of this study were therefore to survey current food environments in ITTF premium junior circuit and gather information to make new guideline for junior players on food environments in ITTF premium junior circuit.

Methods

We accompanied the Japanese cadet and junior team (13 players) at Polish junior and cadet open, which was held in May 2015. Match schedules and rest time between the matches were surveyed. In addition, we did interview survey about dietary intake state of the Japanese junior players.

Results

Average numbers of matches and games during the Polish junior and cadet open were 16 matches and 73 games/player. A male cadet player, who won the silver medal in the men's cadet singles event, repeated 9 matches in a day. His total energy expenditure for matches estimated to be 1125 kcal. He had only about 40 min between matches so that he could not have enough time to have lunch and digest it (he had energy bars and jellies instead of lunch). In addition, there were several players who missed dinner because they had to compete in matches during the dinner time.

Conclusion

Since the match schedules seem to be very tight in ITTF premium junior circuit, junior players sometime have difficulty in having adequate dietary intake and have tendency to be energy deficient. Thus, we propose that enough rest time should be scheduled during lunch and dinner time so that junior athletes are able to have adequate food intake.

The Appropriate Pharmacotherapeutics and the Role of Pharmacist in Sports

Takuro OKADA Japan Table Tennis Association Doping Control Committee

Shiro MATSUO Japan Table Tennis Association Doping Control Committee

In Japan, the Sports Pharmacist System was launched in 2009. Pharmacists have been in charge of anti-doping activities by the launch of this system. Recently, pharmacist activities have expanded gradually.

In Japan Table Tennis Association (JTТА), the Doping Control Committee is in charge of anti-doping activities, such as the testing and educational activities. In addition to the above-mentioned activities, the pharmacist, as a member of this committee, is in charge of the activities based on pharmaceutical knowledge.

The Doping Control Committee has checked the medicine which National Team players take. When players take medicine, they contact the Doping Control Committee in advance. The pharmacotherapeutics in sports have to select the medicine which does not contain banned substances. When players try to take medicine which contains banned substances, we advise them to stop taking medicine and propose an alternative medication. In addition to checking the medicine for banned substance, the pharmacist carries out a suggestion of alternative medication and provision of drug information which doctors use for a medical examination.

As activities except anti-doping, the pharmacist carries out medication history management of players and provision of information to the national team doctors. Moreover, the pharmacist participates in selection of medicines which National team takes to overseas expedition.

I have been in charge of Therapeutic Use Exemption (TUE) committee of the International Table Tennis Federation (ITTF) from 2013. This committee review the TUE application from ITTF players. The pharmacist provides the other committee members with drug information, and moreover the pharmacist gives a pharmaceutical opinion to them.

Thus, pharmacist activities in sports associations have expanded not only anti-doping, but also other activities for which pharmacological knowledge is needed. Pharmacists need to grasp the necessity for pharmaceutical interventions and respond to a sports site request. Thereby, I think pharmacists in sports associations will play a major role.

[13]

Introduction of the so-called “Baseball Elbow” in Japanese Adolescent Table Tennis Players

OGASA Hiroyoshi, MATSUO Shiro

Abstract

In Japan, throwing injuries around elbow joint are common in adolescent baseball players. Among those injuries, osteochondritis dissecans (OCD) of the humeral capitellum is an intra-articular lesion and one of the leading causes of permanent elbow disability. In baseball, the repetitive, excessive compression forces in the radiocapitellar joint caused by elbow valgus stresses during throwing motions can result in OCD of the capitellum. On the other hand, OCD of the capitellum sometimes occur in adolescent elite table tennis players. Similar biomechanical characteristics is supposed in OCD of the capitellum of table tennis players, however, the particulars of its mechanism are unknown. I present several cases of OCD in adolescent table tennis players.

Mental support to the table tennis youth national team

Yoji Yoshizawa (Nagoya University of Economics)

I began mental support to the table tennis national team in 1987. The mental support continued until table tennis world championships (Makuhari) in 1991. The mental support stopped it afterwards.

Mental support to the Sydney Olympics national team began in 2000. I performed mental support to the table tennis world championships (Osaka) national team of 2001 successively. By the table tennis world championships (Osaka), I stayed at the hotel same as a player and observed the psychological condition of the player in breakfast. Furthermore, I snuggled up to a player by the warm-up before the game and supported the psychological condition adjustment before the game. When a game began, I rooted for the player.

I perform mental support of the table tennis youth national team now. When I perform mental support, I am careful about the following things.

- 1) I announced "the study on coaching behavior of the coach whom the motivation of the player was sublimed" into in 2014.
- 2) I extracted 3 factors ("technical guidance" "praise/expectation" "criticism") which prescribed "a coaching behavior" in this study.
- 3) I explained the coaching behavior that a player made a motivation to a coach.
- 4) I asked coaches to understand psychological grounds for coaching and to cope a player.

I perform mental support to the youth national team as a standard of the mental support in the above-mentioned thing.

A mental support has two correspondence methods.

- 1) Method of the mental support to deal with player directly
- 2) Method to change the coaching behavior of coaches

I perform mental support by two methods of the direct and indirect coping methods. I perform an action aiming at the effect that is longer-term than a short-term effect by the mental support. I think to continue mental support in hope of the youth maturing into representative from Japan.

[15]

Establishing Reliability of the Competitive Readiness Scale for Table Tennis Athletes (CRSTTA)

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Keywords: Competitive Readiness, Test-item Reliability

Abstract: The Competitive Readiness Scale for Table Tennis Athletes (CRSTTA) was initially developed and presented during the last ITTF Sport Science Congress held in Paris, France in 2013. The purpose of the test was to measure a table tennis athlete's readiness to compete. At present, there is no available instrument to measure a table tennis athlete's readiness to compete, hence, the development of this test (scale).

Using test construction methodology through face and expert validation, items were generated according to the concepts of mental toughness, coachability, physical readiness, tactical readiness, concentration, anxiety, self confidence, motivation, and team sociability. The researchers were able to present the items and content validity (expert validation) of the instrument. Initial item analysis was also done. In this study, the researchers intend to present further the reliability of the CRSTTA using appropriate statistical tools. The results showed that the overall reliability of the questionnaire by calculating Cronbach's Alpha (α) value, at confidence level 95% was found at **.890** while individual item reliability range was found at **.901**. Four classifications of scoring interpretation such as, Very high level of Competitive Readiness, High Level of Competitive Readiness, Low Level of Competitive Readiness, and Very Low Level of Competitive Readiness were obtained for specific and general interpretations of results. Since there were suggestions made by some foreign participants in the last ITTF Congress to use the instrument in their respective table tennis clubs, an appropriate language translation process be done, and establishing the equivalence of ratings obtained with this instrument when used by different observers known as inter-rater reliability is highly recommended.

[16]

A MULTIDISCIPLINARY INVESTIGATION OF THE EFFECTS OF STATE ANXIETY ON SERVE KINEMATICS IN TABLE TENNIS

Young Ngo (Glasgow University, Scotland)

Abstract

Displays of anxiety in table tennis were assessed through subjective (self-report questionnaire), physiological (heart-rate variability) and kinematic variables. Using a within-groups crossover design, 9 university-level table tennis players completed a series of serves under low- and high-anxiety conditions. Anxiety manipulation was achieved through the introduction a national standard table tennis player, known to the participants, to receive serves in the high-anxiety condition whilst serves were received by no opponent in the low-anxiety condition. Automated motion capture systems consisting of high-speed 3D motion cameras and analytical software (QUALISYS) determined the subject's movement kinematics: bat face angle (degrees) and serve routine duration (seconds). Self-reported state anxiety (MRF-Likert) and heart rate measurements were collected to examine changes between conditions. Contrary to the hypothesis, bat face angles did not change significantly between anxiety conditions and movement times were faster in the high-anxiety condition. In light of these findings, research into other facets of movement behaviour must be analysed to gain a further understanding on the effects of anxiety on performance, which remain unclear.

Key words: Anxiety, bat kinematics, Mental Readiness Form-Likert, heart rate, table tennis.

The importance of pre-performance ritual and rituals between points (The Game Face Routine)

Dora KURIMAY (ITTF SSMC)

An athlete's mental and physical preparation is crucial during the "in-between" times in sports. Loehr (1988, 1994) revealed that the mentally toughest tennis players consistently completed four distinct steps in between points and that this crucial time reveals what is really happening in terms of mental competency and consistency. Mental toughness is learned, not inherited (Loehr, 1995; Kuehl, Kuehl, Tefertiller, 2006; Selk, 2008). Through a case study of working with an elite squash player this presentation will walk you through the importance of creating rituals between points in racket sports. The goal of the presentation is not simply to demonstrate how having a ritual increases performance under pressure but also to illustrate a step-by-step process about how to create a visualization routine as a pre-performance ritual. The in-between time includes four steps: Reaction, Recovery, Readiness (Tactics), and Serve/Serve Return Ritual (Loehr, 1988; 1994; Toon & Kurimay, 2012; Kurimay, 2012; Toon, Kurimay & Kurimay, 2013; Kurimay & Toon, 2014). This presentation will discuss specifically how visualization and in-between time routine can assist to handle pressure and increase performance from the perspective of an elite athlete personal experience.

A qualitative study on the factors for watching table tennis game

Yu-Ling Lee, Tsung-Min Hung

National Taiwan Normal University

ITTF, continental, and national table tennis associations have been working hard to develop table tennis from a participationsportto a both participation and spectator sport. Although these effortshave achieved some progress, there are rooms for improvement on this endeavor. Understanding reasons for watching table tennis game will provide information for improving the game to attract more audience. Therefore, the purpose of this presentation is to share the findingsfrom a qualitative study that interviewed people on their reasons for watching or not watching table tennis game onsite and on TV. Findings from this study can be used to construct a questionnaire for mass data collectionoff and during table tennis competitions.

Closing remarks

Jean-François KAHN, MD, PhD
ITTF Sports Science and Medical Committee

Dear Colleagues, Dear Friends,

First of all, I'd like to thank and to congratulate all of you for having accepted the kind invitation of the JTTA and JTTA Sports Science and Medicine Committee.

The original idea, which has been expressed many years ago already by the ITTF Sports Science Committee, was to create closer contacts with the JTTA SSM Committee which is certainly one of the best organized and active national committee involved in table tennis sciences. Unfortunately for non-Japanese people, most of the data, results of experiments and meetings reports of this committee are usually published only in Japanese!

Therefore in 2013 when Dr. Matsuo proposed to organize a joint meeting with the ITTF SSMC, with communications in English, just before the 2014 WTTC in Tokyo, we all agreed that it was a very good opportunity to develop our cooperation and to explore new fields in table tennis sciences. It was the first step and all participants agreed that we had a successful meeting.

Today, for the second step, it is even better as several communications have been given by invited researchers who do not belong to the JTTA or ITTF Committees. Here again, we have to thank the organizers.

For all these reasons, I am very happy to be here for the second time in 2 consecutive years. From a scientific point of view, during these 2 days, 18 very interesting and well documented communications have been presented, plus 1 exciting special lecture followed by a practical demonstration, and a keynote lecture. After each communication there has been positive discussions and exchanges with the participants which has permitted to share new ideas and new concepts. From a practical point of view, it is clear that not all results presented here can immediately be applied in daily table tennis practice, mainly because the number of subjects or of trials in some experiments is too small to allow for drawing final conclusions and recommendations. And here I am thinking of coaches who are putting pressure on our shoulders and are always looking for new concepts in training. However, what is important for our scientific community is that now there is a strong movement at international level, involving researchers from an increasing number of national associations and universities.

So in the near future I am confident our scientific group will certainly provide the ITTF with useful recommendations as many fields are concerned by the present works. During these 2 days of another successful meeting we have had discussions about biomechanics and physiology, talent detection, performance analysis, medicine and nutrition, antidoping, psychology, development, and applications of new technologies in table tennis. Wow!

As I have the privilege of being the oldest member of the ITTF SSM Committee, and as such I have participated in many meetings and congresses, I can assure you that research in table tennis has significantly increased during the past years, both in quantity and in quality, and I am sure it will continue to develop thanks to such joint meetings.

Last but not least, on behalf of all of us, I'd like to sincerely thank Mr. Fujishige, President of the JTTA, our friend Shiro Matsuo, Chairman of the JTTA SSM Committee, as well as all the members of the organizing committee, the Japan Sports Council, and all the sponsors for the wonderful stay we have had here in Japan.

Domo arigatou gozaimasu.