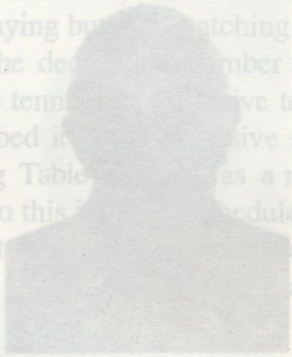
THE 4TH
INTERNATIONAL TABLE TENNIS FEDERATION
SPORTS SCIENCE CONGRESS

PROGRAMME
&
ABSTRACTS

26-30 April, 1995
Peace Hotel, Beijing, China

The ITTF - International Academy of Table Tennis Sciences
(ATTSc)

INVITATION



Bungo MATSUKAWA
ATTSc Honorary President
Chairperson of Saitama Institute of Technology

On behalf of The International Table Tennis Federation I would like to welcome you all to the 4th ITTF Sports Science Congress and to thank the Chinese Table Tennis Association for their help in making the necessary arrangement.

Sports science plays a significant part in increasing our knowledge of table tennis and the equipment used. It enables players and coaches to understand the workings of both mind and body and it helps administrators to know the effects and interactions of the various materials used in table tennis.

I wish you all a pleasant stay in China and hope that the discussions will lead to an even greater understanding or our sport.

Lollo Hammarlund
ITTF President

It is with great pleasure and expectation that I invite you all to the 4th ITTF Sports Science Congress here in Beijing, China. On this occasion, I'd like to express my deepest gratitude to the ITTF president Mr Lollo Hammarlund and the CTTA president Mr Xu Yinsheng for the leadership and cooperation they have exhibited for the arrangement of the congress. I am also indebted to many other members of the ITTF and the CTTA for the preparation and administration of the congress.

I am greatly honored to have participants from all over the world, who are committed to our beloved sport; and I strongly hope that this will be another fruitful congress, alive with creative, resourceful, and inspiring discussions.

It is now four years since the ITTF - International Academy of Table Tennis Sciences (ATTSc) was founded at the Saitama Institute of Technology, Japan, at the proposal of the late ITTF president Mr Ichiro Ogimura. The purpose of the ATTSc is to promote a scientific approach to table tennis, to explore the sports in various directions, and also to help develop table tennis into a sport which the world will enjoy not only playing but also watching.

Recently, it has been pointed out that the decreasing number of strokes in a rally, or the shortening length of rallies, is making table tennis less attractive to spectators. This is the very reason why the late Mr Ogimura, who ascribed it to the excessive spin of the ball, proposed the topic, "Appropriate Rotation for Developing Table Tennis", as a main agenda of the congress; accordingly, not a few presentations related to this issue are scheduled in the congress.

I expect that the 4th ITTF S.S.C. will contribute to addressing such issue and others to develop table tennis still further and to strengthening the bond between researchers from different nations who love table tennis uniformly.

Bungo MATSUKAWA
ATTSc Honorary President
Chairperson of Saitama Institute of Technology

It is our great honor that the 4th International Table Tennis Federation (ITTF) Sports Science Congress will be held in Beijing in China in April 1995 prior to the 43rd World Table Tennis championships.

Owing to the arduous work of the scientists committed to our sports, the development of table tennis has been accelerated, thus making our sport more and more attractive all over the world. The Congress will provide a golden opportunity for the attendants to exchange experience in the area of scientific and technological research and achieve a fruitful result both for scientific research and renewal of friendship among friends in the table tennis family.

I am sure that the attendants will enjoy their stay in Beijing, a city boasting a great cultural heritage and scenic beauty.

I cordially invite you to the 4th ITTF Sports Science Congress in Beijing.

Xu Yinsheng
ITTF Vice-President
CTTA President

Dear Colleagues and Friends,

It is my great pleasure and honor to invite you to our 4th Congress in Beijing, one of the table tennis centers of the world.

Allow me first to remember, in deep sorrow, our dear former partner, a colleague, a friend and pioneer of a new era of table tennis introducing scientific approach - Ichiro Ogimura.

In former years, despite lack of material help, we managed to introduce and provide important experimental and research work, to mobilize and use specialists - amateurs who are very difficult to find, to establish new national academies or regional groups concerned with actual problems, tasks and demands of the ITTF, National Associations or Clubs.

In this world of ignorance and dilettantism in which more than 90% of leading people of highest institutions are not sufficiently educated for their positions, we are very satisfied that we have, in our own table tennis family, "Sports in Science and Science in Sports". But it is also our moral and ethic, regardless of passivity of highest international institutions, to promote our ideals; tolerance, humanity, quality, open fight against aggression, nationalism and chauvinism.

Cordially welcome you in Beijing.

Yours,

Zarko J. Dolinar
ATTSc President
ITTF S.S.C. Chairperson

PROGRAMME

The ITTF - International Academy of Table Tennis Sciences (ATTSc)

ITTF President: Lollo Hammarlund, *Sweden*

Honorary Academy President: *Bungo Matsukawa*, Chairperson of Saitama Institute of Technology, *Japan*

Kuniko Tanioka, President of Chukyo Women's University, Junior College, *Japan*

Academy President: *Zarko J. Dolinar*, Chairperson of ITTF Sports Science Committee, *Switzerland*

Research Coordinator: *Paul Schiltz*, Member of ITTF Equipment Committee, *Luxembourg*

Nobuo Yuza, Professor of Chukyo Women's University, Junior College, Secretary-General of ATTSc, Chairperson of JTTA Sports Science Committee, Secretary of ITTF Sports Science Committee, *Japan*

Working Secretariats: *Xu Yinsheng*, Vice-President of ITTF, President of CTTA, *China*

Bungo Matsukawa, *Japan*

Albert Shipley, Secretary-General of ITTF, *England*

Executive Board Members the 4th ITTF Sports Science Congress in Beijing, China

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Bungo Matsukawa, *Japan*

Kuniko Tanioka, *Japan*

Patron: *Lollo Hammarlund*, *Sweden*

Chairperson: *Zarko J. Dolinar*, *Switzerland*

Vice Chairperson: *Takeshi Mori*, Professor of Waseda University, Vice-President of JTTA, *Japan*

Yukinobu Sato, Member of Saitama Institute of Technology, Managing Director of JTTA, *Japan*

Nobuo Yuza, *Japan*

Programme Coordinator: ***Shuichi Hiruta***, Nagoya University, Member of ITTF Sports Science Committee, Vice-Chairperson of JTTA Sports Science Committee, Secretary of ATTSc, *Japan*
Shunryu Fukushima, Saitama Institute of Technology, *Japan*
Hideki Yamaoka, Advisory Staff to ATTSc, *Japan*
Wataru Ono, University of Tokyo, Editor of International Journal of Table Tennis Sciences, *Japan*
Yuko Moriyasu, Nagoya University, Editor of International Journal of Table Tennis Sciences, Assistant to Secretary-General of ATTSc, *Japan*

Congress Coordinator: ***Yu Bin***, Deputy Secretary-General of CTTA, *China*
Suguru Araki, Hofsta University, Committee on International Affairs of JTTA, *USA*
Jean Francois Kahn, Member of ITTF Sports Science Committee, *France*

Meeting Coordinator

General Chairperson: ***Suguru Araki***, *USA*

Chairperson: ***Guan Yan***, Member of ITTF Sports Science Committee, *China*
Qin Zhifeng, Member of ITTF Sports Science Committee, National Research Institute of Sports Science, *China*
Wu Huanqun, National Research Institute of Sports Science, *China*
Zhang Xiaopeng, National Research Institute of Sports Science, *China*
Wang Jiazheng, Beijing University of Physical University, *China*
Wu Xiuwen, Beijing University of Physical Education, *China*
Tao Zhixiang, Beijing University of Physical Education, *China*
Su Piren, Beijing University of Physical Education, *China*
Li Zhenbiao, Tianjin Institute of Physical Education, *China*
Zeng Zhenhao, Zhongshan University, *China*
Liu Weizeng, Shandong Institute of Sports Science & Skill, *China*
Jean Francois Kahn, *France*
Roland Seydel, Member of ITTF Sports Science and Equipment Committee, *Germany*
Michael James Scott, Member of ITTF Sports Science Committee, *USA*
Fujio Yamamoto, Fukui University, *Japan*
Yutaka Tsuji, Osaka University, *Japan*
Yoshio Kobayashi, Chukyo University, *Japan*
Shuichi Hiruta, *Japan*
Kazuto Yoshida, Shizuoka University, Member of ITTF Sports Science Committee, Vice-Chairperson of JTTA Sports Science Committee, *Japan*

Place for Announcement: ***Masayuki Watanabe***, Tokyo Gakugei University, Member of JTTA Sports Science Committee, *Japan*
Zhang Zhijie, *China*
Tang Jianjun, *China*
Takashi Kitahara, Tokyo Kyoiku College, Member of JTTA Sports Science Committee, *Japan*

General Affairs: ***Yu Bin***, *China*
Shunryu Fukushima, *Japan*
Junichi Kasai, Waseda University, Member of JTTA Sports Science Committee, *Japan*
Mami Horikawa, Assistant to Secretary-General of ATTSc, *Japan*

Accountant: ***Kazuto Yoshida***, *Japan*
Toshiko Takeuchi, Chukyo University, Member of JTTA Sports Science Committee, *Japan*

Record: ***Jean Francois Kahn***, *France*
Qin Zhifeng, *China*
Suguru Araki, *USA*
Wataru Ono, *Japan*
Hideki Yamaoka, *Japan*

Typist: ***Hiromi Tsujinishi***, Assistant to Secretary-General of ATTSc, *Japan*
Kumiko Muraguchi, Assistant to Secretary-General of ATTSc, *Japan*

1. Schedule

April 26th - April 30th, 1995

Wednesday,26th	**19:00 -**	**Welcome Dinner**
Thursday,27th	**09:00 - 09:40**	**Opening Ceremony**
	09:40 - 12:00	**Keynote Speech (1),(2)**
	12:00 - 14:00	**Lunch**
	14:00 - 15:00	**Keynote Speech (3)**
	15:00 - 18:00	**General Session**
	19:00 -	**Dinner**
	Peking Opera in the evening	
Friday,28th	**09:00 - 10:00**	**Special Topic**
	10:00 - 12:30	**General Session**
	12:30 - 14:00	**Lunch**
	14:00 - 16:30	**General Session**
	16:30 - 17:45	**General Meeting**
	17:45 - 18:00	**Closing Ceremony**
	19:00 -	**Dinner**
	Acrobatic show in the evening	
Saturday,29th	**Excursion (Tour to the Great Wall and the Ming Tomb)**	
Sunday,30th	**Travel to Tianjin by bus**	

(Breakfasts and lunches will be at the hotel and dinners will be outside.)

2. Venue

Peace Hotel, Beijing, China

Address: 3 Jinyu Hutong, Wangfujing, Beijing 100044, China

Phone: +86-10-512-8833
Fax: +86-10-512-6863

3. Time Table

Wednesday, 26th April

19:00 - **Welcome Dinner**

Thursday, 27th April

09:00 - 09:30 **Opening Ceremony**

(1)The President & the Vice-President of the ITTF
Lollo HAMMARLUND, *Sweden*
XU Yinsheng, *China*

(2)The Honorary President of the ATTSc
Bungo MATSUKAWA, *Japan*

(3)The ATTSc President
Zarko J. DOLINAR, *Switzerland*

09:30 - 09:40 **Break**

09:40 - 12:00 **Keynote Speech (1),(2)**

09:40 - 10:30 **(1)Table tennis rackets and the mechanics of the game**
Roland SEYDEL, Member of the ITTF Sports Science Committee & the Equipment Committee, *Germany*

10:30 - 10:45 **Discussion**

10:45 - 11:00 **Coffee Break**

11:00 - 11:45 **(2)Dynamics and Computer Simulation of Ball Trajectory**
Fujio YAMAMOTO, Mechanical Engineering, Faculty of Engineering, Fukui University, *Japan*

11:45 - 12:00 **Discussion**

Chairperson
WANG Jiazheng, *China*
QIN Zhifeng, *China*
Yutaka TSUJI, *Japan*

12:00 - 14:00 **Lunch**

14:00 - 15:00 **Keynote Speech (3)**

14:00 - 14:45 **(3)Collisional properties of ball-racket interactions in terms of normal and tangential coefficients of restitution**

Suguru ARAKI, Hofsta University, Member of Committee on International Affairs of JTTA, *USA*

14:45 - 15:00 **Discussion**

Chairperson

Fujio YAMAMOTO, *Japan*
Yutaka TSUJI, *Japan*
Roland SEYDEL, *Germany*

*** Presentation (10 Min.) and discussion (5 Min.) for each general address**

15:00 - 18:00 **GENERAL SESSION**

15:00 - 16:00 **1. SPIN**

Chairperson

ZHANG Xiaopeng, *China*
Roland SEYDEL, *German*
Fujio YAMAMOTO, *Japan*

16:00 - 16:15 **Coffee Break**

16:15 - 16:45 **2. TRAINING**

Chairperson

WU Huanqun, *China*
ZENG Zhenhao, *China*
Shuichi HIRUTA, *Japan*

16:45 - 18:00 **3. PSYCHOLOGY**

Chairperson

SU Piren, *China*
TAO Zhixiang, *China*
Fernando Vitor LIMA, *Brazil*

19:00 - **Dinner, Peking Opera**

Friday, 28th April

09:00 - 10:00 **Special Topic**

09:00 - 09:45 **Chemical characterization of "CLEAN GLUE"**
Toxicological risk evaluation
J.De GRAEVE, Professor of Institute of Pathology, *Belgium*
Eric MASSANGE, *Belgium*

09:45 - 10:00 **Discussion**
Chairperson
GUAN Yan, *China*
Jean Francois KAHN, *France*
Michael James SCOTT, *USA*
Yoshio KOBAYASHI, *Japan*

10:00 - 12:30 **GENERAL SESSION**

10:00 - 11:00 **4. METHODOLOGY(1)**

Chairperson
LI Zhenbiao, *China*
LIU Weizeng, *China*
Kazuto YOSHIDA, *Japan*

11:00 - 11:15 **Coffee Break**

1115 - 12:30 **5. METHODOLOGY(2)**

Chairperson
WU Xiuwen, *China*
TAO Zhixiang, *China*
ZENG Zhenhao, *China*
Shuichi HIRUTA, *Japan*

12:30 - 14:00 **Lunch**

14:00 - 16:30 **GENERAL SESSION**

14:00 - 15:30 **6. METHODOLOGY(3)**

Chairperson
WANG Jiazheng, *China*
WU Xiuwen, *China*
TAO Zhixiang, *China*

15:15 - 15:30 **Coffee Break**

15:30 - 16:30 **7. MEDICINE, PHYSIOLOGY & OTHERS**

Chairperson
GUAN Yan, *China*
Jean Francois KAHN, *France*
Michael James SCOTT, *USA*

16:30 - 17:45 **General Meeting**
Zarko J. DOLINAR, ATTSc Chairperson
Nobuo YUZA, ATTSc Secretary-General

17:45 - 18:00 **Closing Ceremony**
Zarko J. DOLINAR, 4th ITTF S.S.C. Chairperson
Takeshi MORI, 4th ITTF S.S.C. Vice-Chairperson

19:00 - **Dinner, Acrobatic Show**

Saturday, 29th April

08:30 **Excursion (Tour to the Great Wall and the Ming Tomb)**

Sunday, 30th April

10:00 **Travel to Tianjin by bus (2 hours)**

KEYNOTE SPEECH (1)(2)(3)

Thursday, 27th April

09:40 - 15:00 **Keynote Speech (1),(2),(3)**

09:40 - 10:45 **(1)Table tennis rackets and the mechanics of the game**
TIEFENBACHER, Konrad, SEYDEL, Roland(Germany), *& DUREY, Alain* (France)

11:00 - 12:00 **(2)Dynamics and Computer Simulation of Ball Trajectory**
YAMAMOTO, Fujio, TSUJI, Yutaka, NAKAGAWA, Makoto (Japan)

14:00 - 15:00 **(3) Collisional properties of ball-racket interactions in terms of normal and tangential coefficients of restitution**
ARAKI, Suguru (USA), SATO, Shinichi, and YAMAZAKI, Hitoshi (Japan)

SPECIAL TOPIC

Friday, 28th April

09:00 - 10:00 **Chemical characterization of "CLEAN GLUE" Toxicological risk evaluation**
GRAEVE, J. De, MASSANGE, Eric (Belgium)

4. Addresses of General Session

Thursday, 27th April

15:00 - 16:15 **1. SPIN**

15:00 - 15:15

(1) Research work and development of the rotation theory of table tennis in China
WANG Jiazheng, LIU Tianyang, WANG Xin (China)

15:15 - 15:30

(2) A preliminary study on table tennis spin and regulations
QIN Zhifeng (China)

15:30 - 15:45

(3) On appropriate spin and its assured measures
LIU Weizeng (China)

15:45 - 16:00

(4) A study of spin in table tennis service.
ZHANG Xiaopeng (China)

16:00 - 16:15

Coffee Break

16:15 - 16:45 **2. TRAINING**

16:15 - 16:30

(5) Analysis on training for Chinese table tennis superiority from 1959 to 1989
WU Huanqun (China)

16:30 - 16:45

(6) A study on the system of Chinese table tennis skill and tactical training methods
ZENG Zhenhao, WANG Shusheng (China)

16:45 -18:00 **3. PSYCHOLOGY**

16:45 - 17:00

(7) A discussion on the specific consciousness of table tennis players
SU Piren China)

1700 - 17:15

(8) Preliminary study on the intelligence of Chinese table tennis players
TAO Zhixiang (China)

17:15 - 17:30

(9) A scientific and practical study about psychological factors concerning the advancement of table tennis play, through using the skill of top spin side spin.
Abdelkader, Saleh Abdullah (Saudi Arabia)

17:30 - 17:45

(10) Concepts, analysis and regulation of the psychic stress in table tennis
SAMULSKI, Dietmar Martin (Brazil)

17:45 - 18:00

(11) Psychological techniques of behavior control during critical situation at table tennis competition
LIMA, Fernando Vitor (Brazil)

Friday, 28th April

10:00 - 11:15 **4. METHODOLOGY (1)**

10:00 - 10:15

(12) A biomechanical study on movement of forehand top spin stroke in table tennis
YOSHIDA, Kazuto, IIMOTO, Yuji, ANDO, Shintaro (Japan)

10:15 - 10:30

(13) A revised method of deciding the order in a round robin tournament
HAN Zhizhong (China)

10:30 - 10:45

(14) A study of CYX-94 computer draw system for the table tennis championships
CHENG Jiayan, ZHANG Yingqiu, SUN Huixiao (China)

10:45 - 11:00

(15) Technical index of Olympic table tennis gold medal winner
LI Zhenbiao (China)

11:00 - 11:15

Coffee break

11:15 - 12:30 5. METHODOLOGY (2)

11:15 - 11:30

(16) An analysis of the characteristics of the main skills performed by excellent chop-and-attack players and a discussion of their uses of these skills
WU Xiuwen, TANG Jianjun (China)

11:30 - 11:45

(17) Analyses of Chinese excellent table tennis attacking players' service techniques and research of their utilization
WU Xiuwen, ZHANG Zhen (China)

11:45 - 12:00

(18) A comparative analysis of the strike movement component key element in Chinese and British table tennis theories
TANG Jianjun (China)

12:00 - 12:15

(19) The expert system of the Republic of Slovenia for orientation of children into table tennis
KONDRIC, Miran (Slovenia)

12:15 - 12:30

(20) Discuss the rhythm and rhythm change of table tennis
ZHANG Zhijie (China)

12:30 - 14:00 Lunch

14:00 - 15:30 6. METHODOLOGY (3)

14:00 - 14:15

(21) It's time to raise the height of table tennis tables
SCOTT, Michael James (USA), DOLINAR, Zarko J. (Switzerland)

14:15 - 14:30

(22) Reasonable improvement of bat mold will urge table tennis game to develop toward high level and extensiveness
LIU Weizeng (China)

14:30 - 14:45

(23) Estimation of racket speed by ball-traveling distance in table tennis smashes
HIRUTA, Shuichi, YOSHIDA, Kazuto, IIMOTO, Yuji, SHIMAOKA, Midori, TAKEUCHI, Toshiko, YUZA, Nobuo (Japan)

14:45 - 15:00

(24) Studies on the velocity of the ball and the accuracy of various strokes in table tennis

KASAI, Junichi, MORI, Takeshi, WATANABE, Masayuki (Japan)

15:00 - 15:15

(25) Researching the mental factors which affect the technique's level on Chinese elite table tennis players

TAO Zhixiang (China)

15:15 - 15:30

Coffee Break

15:30 - 16:30

7. MEDICINE, PHYSIOLOGY & OTHERS

15:30 - 15:45

(26) Long term effects of table tennis on the health related fitness in "mama-san" (housewives) players

KOBAYASHI, Yoshio, HOSOI, Teruo, TAKEUCHI, Toshiko (Japan)

15:45 - 16:00

(27) Gynecopathy of elite female players of table tennis

GUAN Yan (China)

16:00 - 16:15

(28) Acquired immunodeficiency syndrome (AIDS) and table tennis

SCOTT, Michael James (USA), DOLINAR, Zarko J. (Switzerland)

16:15 - 16:30

(29) National leagues and world ranking

ERIKSSON, Peter (Finland)

ABSTRACTS

Keynote Speech (1) (27th April, 09:40 -10:45)

TITLE **Table tennis rackets and the mechanics of the game**

NAME TIEFENBACHER, Konrad (GERMANY)
SEYDEL, Roland, PhD, Research & Innovation of **adidas** AMERICA, Member of Sports Science Committee and Equipment Committee of ITTF (GERMANY)
DUREY, Alain, PhD, Professor of Laboratoire Interuniversitaire de Recherche sur l'Education Scientifique et Technologique (FRANCE)

Key word: *Table tennis, Simulation, Aerodynamics, Ball rebound and racket coverings*

The study worked out the influence of different types of table tennis coverings and woods, glued and unglued coverings with variable sponge thickness related to different table tennis technics (service and return, top spin and block, top spin and defense). The published scientific models for trajectories of table tennis balls (R. Seydel 1990), the rebound of the ball on the table (A. Durey 1989) and the rebound of the ball on the racket (K. Tiefenbacher 1994) are used as a combined software tool to evaluate basic table tennis questions. One objective of our study was to characterize quantitatively the advantages and disadvantages of different types of table tennis rackets for different types of table tennis strokes. Parameters which have been looked at are:

a) range of angles under which the ball passes the net and hits the table;
b) trajectories' curvature;
c) comparison of area where the ball hits the table;
d) time aspects;

Keynote Speech (2) (27th April, 11:00 - 12:00)

TITLE **Dynamics and computer simulation of ball trajectory**

NAME YAMAMOTO, Fujio, PhD, Professor of Department of Mechanical Engineering, Fukui University (Japan)
TSUJI, Yutaka, PhD, Professor of Department of Mechanical Engineering, Osaka University (Japan)
NAKAGAWA, Makoto, Koshi High School (Japan)

Key word: *Ball trajectory, Computer simulation, Computer graphics & animation*

Motion of a table tennis ball includes transverse velocity, spin velocity, ball bouncing on table and bat. The ball motion can be analyzed by the computer simulation technique. The fundamentals of the analysis is based on dynamics. The present paper discusses the following problems:

1. Lift and drag acting on a ball. They are decided by the Reynolds number, spin effects (Magnus effects), and unsteady deceleration.
2. Ball bouncing on table and bat. The behavior of the ball bouncing is able to be calculated using the spring and dash-pot model and will be demonstrated on a TV monitor after taking the super high speed video pictures and computer animation. Since the deformation of ball shape at the bouncing is not negligible, the problem of air compressibility should be discussed.
3. Virtual mass effects. Since the ball is light for its size, and is accelerated and decelerated at and after the bouncing, virtual mass effects of viscous air inside and outside the ball should be taken into account. Especially the effect of the internal air flow on the virtual mass has not been discussed before, but will be demonstrated using the visualization and image processing technique which was developed by the present authors.
4. Rheological effects of rubber. When very high speed ball impinge with a bat, the super high speed video pictures show the wave motion of rubber due to the impact and quick damping phenomenon which depend on the types of bat and rubber.
5. The effects of all mass and spin velocity will be demonstrated on a TV monitor after the computer animation technique. They are basic factors for the purpose to make table tennis game more attractive for both players and spectators. Using the computer animation players, physical scientists, educational teachers can expect to find some solutions for problems of improvement of playing and coaching techniques.
6. Finally some examples of ball trajectories are shown using the computer graphics and animations.

Keynote Speech (3) (27th April, 14:00 - 15:00)

TITLE: **Collisional properties of ball-racket interactions in terms of normal and tangential coefficients of restitution**

NAME: ARAKI, Suguru, PhD, Professor of Department of Physics, Hofsta University (USA)
SATO, Shinichi, Tamasu Ltd. and YAMAZAKI, Hitoshi, Tamasu Ltd. (Japan)

Key word: *Collision dynamics, Ball-racket interactions, Surface properties*

Collision dynamics of the spinning table tennis ball are systematically studied by introducing a new parameter ε_t, the tangential coefficient of restitution, in addition to the conventionally accepted parameter ε_n, the normal coefficient of restitution. The normal coefficient of restitution describes the dissipative property of head-on collisions between the ball and the racket, which would be significant even if the spin degrees of freedom were completely ignored. The tangential coefficient of restitution is closely related to the surface properties of the two colliding members, and controls the coupling between translational and spin degrees of freedom. Among all the ball sports the table tennis ball has the most extreme mass distribution: its total mass is concentrated within the outermost 2% region of the entire radius. Thus, the tangential coefficient of restitution plays a crucial role in the spin dynamics of table tennis.

In this paper we experimentally determine the dependence of the normal coefficient of restitution on the normal component of incident relative velocity. The tangential coefficient of restitution is also found to depend on the tangential component of incident relative velocity as well as on the incident angle. Making use of the simple configuration of ball-racket collisions, we give the preliminary but first report of its dependence upon incident speeds and angles. Most researchers in table tennis dynamics have treated the coefficients of restitution as constant parameters. Thus, the present work should help us evaluate whether or not this treatment is valid.

Finally, taking the average of these coefficients over many collisions, we attempt to locate a variety of rackets, with and without glue effects, on the (ε_t, ε_n) diagram as a step toward classifying the commercially available rackets quantitatively on a physically sound basis.

Special Topic (28th April, 09:00 - 10:00)

TITLE : **Chemical characterization of "CLEAN GLUE" Toxicological risk evaluation**

NAME : GRAEVE, J. De, PhD, Professor of Institute of Pathology (Belgium)
MASSANGE, Eric (Belgium)

Key word: *ITTF Standards, Clean Glue, Toxicological hazard evaluation, Risk assessment*

The study has two major objectives :

1) *To control if the clean glue meets the now ITTF standards in its chemical composition i.e.
- no aromatic solvents
- no chlorinated solvents
- n-hexane concentration below 2%
total aromatics below 0.5%

2) *To evaluate the potential hazard inherent to the usual utilization of the glue during the preparation of table tennis racket coverings.

To answer those questions, an extensive analysis was conducted on the volatile fraction of the glue material (ref.: Caldie 405634 CDM) in order to identify the solvents content and especially those could be volatilized in the atmosphere causing a potential source of hazard for people handling this material or in close contact with it.

The best sensitive and specific analytical technologies were used to identify and, when required, to quantify the respective amounts of the most relevant products that could affect the hazard potential of the glue.

A further toxicological risk evaluation could finally be realized from the data collect during the analytical experimentation survey.

CONCLUSIONS

The analysis conducted on the 《CLEAN GLUE》 sample leads to the acceptance of the following major conclusions:

- Volatile fraction composition
* Aliphatic alkanes C6-C7: heptane; methyl-hexane(s); dimethylpentanes(s)...
* Alycyclic alkanes C6-C7: methylcyclohexane; alkyl-pentane(s)...
* No detectable amounts of aromatic solvents (largely less than 0.5%)
* No detectable amounts of chlorinated solvents
* N-hexane is present but in concentrations largely below 2% (0.013%)
* No mineral spirit or naphtha (confirmation of the absence of aromatic hydrocarbons and hexane at high levels).
* Diphenylamine is will present but only at ultimate trace levels.

Toxicological hazard evaluation and risk assessment

According to the analytical data, one can reasonably postulate that the volatile fraction that could be issued in the atmosphere will be very limited and of no danger. Most of the TWA (Tie Weighted Average) values reported for the major retrieved chemicals are relatively high.

Any such figures would never be reached in normal operating condition or atmospheres.

The presence of a toxic compound like diphenylamine could not be considered as a potential source of hazard at its concentration in the matrix is very low and its volatility limited. The corresponding TWA value of 10 mg/m^3 would never be reached, even if one takes into consideration a safety factor and margin of 10.

The 《CLEAN GLUE》 meets the ITTF standards and could be authorized as a liquid glue free from aromatic and chlorinated solvents. The authorization for a limited standard value of 2% for n-hexane is also fulfilled.

The most relevant volatile fractions that could be liberated in the atmosphere during the operations of racket coverings using a 《CLEAN GLUE》 could not be regarded as a potential hazard both for players and attendance. All the different major chemicals that could be vaporized whenever using the required quantity of glue, will never produce detrimental hazardous concentration levels of toxic solvents vapors. The expected concentrations in air would largely remain below harmful or even worrying levels. The amounts of various solvents or other volatile hazardous toxic molecules issued from cigarette smoking should certainly be of more concern. No particular risk seems to be associated to the utilization of this type of glue. Only accidental problems could arise due the inflammable properties of the Heptane class of solvents. Considering the limited amount of cans or bottles of glue available in a sport hall during a competition, this could not be regarded as a relevant problem. This conclusion is also valid in case of accidental ingestion.

General Session (1-29)

(1) TITLE: **Research work and development of the rotation theory of table tennis in China**

NAME: WANG Jiazheng, LIU Tianyang, WANG Xin (China)

Key word: Table tennis, Rotation, Table Tennis Dynamic Spin-surveying Metre

In this paper, through the method of literature survey, we summarize a large quantity of literature and intelligence data on table tennis rotation theory research that ranges from the 1950's to the early 1990's in China. We intend to expound the history, current situation and the latest trend in field of table tennis rotation theory research, and to supply enriched information for further research. The table tennis rotation research in China experienced a development process that advanced from the shallower to the deeper, the perception to the rational and quantity to quality. In the principle that theory research should serve practical purposes on one hand.

China made efforts in the fundamental theory research on table tennis rotation, and gradually formed a quite systematic, complete, and scientific system. On the other hand, researchers and practitioners together designed and fabricated the Table Tennis Robot and Dynamic Spin-surveying Metre, so as to complete the transition from quantitative research to qualitative one and received outstanding achievements. Recently, with the advancement of "relative law of rotation and speed", breakthrough has been gained in the table tennis-rotation-law research in China.

We estimate that from now on in China, the qualitative research for table tennis rotation based on experiments will be strengthened and furthermore, multi-angle and omnibearing exploration in the height of fluid mechanics, advanced mathematics human biomechanics, artificial intelligence, and material science will be carried out. Naturally, how to improve the athlete's skill in taking advantage of spin during training and matches should not be ignored either.

(2) TITLE: **A preliminary study on table tennis spin and regulations**

NAME: QIN Zhifeng (China)

Key word: Table tennis, Spin, Regulation

Table tennis was once a national sport in China in the 1960's and the 1970's. Millions of people played and enjoyed it. Since the 1980's the "table tennis population" has decreased as the match has had short rallies and become difficult to understand. One important reason is improved ball's spin.

Using the PD--1 Dynamic Spin-surveying Instrument, we have made analyses of the spins produced by 24 national players of different styles and different rackets' properties during test in loops, chops and serves in 1987. It also gives a preliminary discussion on the possibility to increase the length of rallies and attract more people to join the sport by reducing the thickness of sponge and encouraging pimples-out rubber and chopping style.

(3) TITLE: **On appropriate spin and its assured measures**

NAME: LIU Weizeng (China)

Key word: *Spin*

There are no other ball games in which spin factors are more important than in table tennis sport. The spin of the ball greatly enriches the technical kinds of table tennis sport and the contest's antagonistic connotation. It produces a great variety of technical schools. The spin of the ball, displayed along with human physique, spirit, skill and intelligence, etc., attracts a large number of participants and funs. It has greatly promoted technical development of table tennis sport. However, the spin makes a good effect on the game only under appropriate situations. Otherwise, it will hinder the development of the sport. For example, since the 1970's, strong top spin loop drive has been making the "chop" style, which originated from Europe, dead. Great spin serves have reduce the length of rallies. These situations are making current table tennis sport to face disadvantage of reducing styles, interests, participants and audiences. Controlling the spin in an appropriate range to have a good effect has become an important task which deserve emphasis and must be settled. The author has offered two assured measures to be taken:

1. Physical characters of the hitting surface of the bat have sensitively determinative influences on the ball's movement. As stated in the paper, limit the coefficient of dynamic friction between the ball and the bat: μ, under condition of $2.5 \gg \mu \gg 1$. The shape of pimpled-out rubber grain must be a straight cylinder or a straight frustum of a cone, and the ratio between the top circle diameter and its height of the cylinder or the frustum of a cone K must be $K \gg 1.5$. The total area of all the grains' top surfaces in one square centimeter S must be: $S \gg 25mm^2$ These two demands above will let the degree and difference of spin be accepted by players.

2. Draw three 2mm wide red circle lines on the surface of the ball, the planes which these three circle lines lie in are vertical to each other. Or, paint orange and white colors on each half of the ball to make spin directly perceived by players and audiences.

Two measures mentioned above not only do not change the skills in current use greatly, but also have a limiting effect on excessive spin, and they are also easy to carry out. However, it is advised to take either, not both of the two measures.

(4) TITLE: **A study of spin in table tennis service**

NAME: ZHANG Xiaopeng (China)

Key word: *Table tennis, Service, Spin*

It is no doubt that service is very important in table tennis matches, and that it is a key element in keeping superiority of the Chinese National Team in the World Championships. In this paper, the spin of 16 kinds of service techniques of 85 Chinese National T. T. Team players (male and female) was tested by the PD-1T.T.Testing Spin Instrument and PJ-1T.T.Robot. The results are as follows:

1. There is no significant difference in the strength of spin between male and female players of the National Team;

2. The spin of service from half-squat posture is stronger than that from standing posture;

3. The spin produced by pimples-in rubber rackets is stronger than that produced by pimples-out ones;

4. The spin in long services is stronger than that in short ones;

5. The spin of side-up services is stronger than that of side-down ones;

6. The simulation test of spin using the above-mentioned T.T. Robot shows that the spin of service of some elite European male players is stronger than that of the Chinese National Team male players.

(5) TITLE: **Analysis on training for Chinese table tennis superiority from 1959 to 1989**

NAME: WU Huanqun (China)

Key word: Winning factors, Technical style, Strong techniques

From 1959 to 1989, China took part in the World Table Tennis Championships fourteen times, winning 57.6 percent of all the gold medals. This superiority reflects the success in every aspect of a gigantic systematic engineering. This paper, only on the basis of training, regarding every strong country in table tennis field as a reference, thinks that China is better than other countries in the realization of winning and in the training direction of outstanding strong techniques, which is a precious experience of China.

(6) TITLE: **A study on the system of Chinese table tennis skill and tactical training methods**

NAME: ZENG Zhenhao, WANG Shusheng (China)

Key word: Table tennis, Skill, Tactical, Training methods

Adopting the methods of literature and data, investigation and interview of experts, this thesis has made a overall, through inquiry into the system of Chinese table tennis skill and tactical training methods. Through deduction and induction, we got the implication, theoretical basis, main effects and fundamental request of eight kinds of training methods, which are competition, imitation, classification, multi-ball, the strong leading the week, ordered, disordered, model. This paper also made a systematic study of the system of Chinese table tennis skill and tactical training method according to systematic science theory. Therefore, we think that the eight kinds of training methods don't parallel each other or be in the same level; they differ not only in size but also in level; they can be not only used singly but also combined and used crisscross; during different training level or period, they should feedback each other and cycle repeatedly through the whole process of sports training. These views will supply new contents for perfecting and enriching the special training theory of Chinese table tennis.

(7) TITLE: **A discussion on the specific consciousness of table tennis players**

NAME: SU Piren (China)

Key word: *Table tennis consciousness, Contents of consciousness, State of consciousness*

Table tennis consciousness refers to table tennis player's conscious mental activities during training and competition, activities that have definite aim and directions. Both the contents and the state of consciousness are analyzed.

The most salient feature of table tennis consciousness is its dynamic role. A player with good consciousness can achieve excellent results in training. To cultivate table tennis consciousness, special and specific programs should be drawn up, theoretical courses should be taken and trainees should be taught to cultivate relevant consciousness during training.

(8) TITLE: **Preliminary study on the intelligence of Chinese table tennis players**

NAME: TAO Zhixiang (China)

Key word: *Intelligence, Athlete, Correlation, Validity of measurement*

Wechsler's Adult Intelligence Scale (China Reversion) and Wechsler's Intelligence Scale for Children (China Reversion) were used to test 95 Chinese table tennis players on different skill levels. The results show that their intelligence is about average (full scale IQ=105.85) and their Verbal IQ is slightly higher than their Performance IQ(107.83 and 101.59, respectively). The intellectual development of students majoring in physical education is better than that of players in the national team. The intellectual development of players in the national team is better than that of players in the national youth team. There is a low and negative correlation between training years and FIQ ($r = -0.22$, $p<0.05$). These results are quite different from the conclusions reached by other studies in this field, which show that we still lack enough evidence to substantiate the causal relationship between athletic training and intellectual development.

(9) TITLE: **A scientific and practical study about psychological factors concerning the advancement of table tennis play, through using the skill of top spin and side spin**

NAME: ABDELKADER, Saleh Abdullah (Saudi Arabia)

Key word: *Top spin drive, Side spin drive*

The first aim of the study is to find by an empirical method whether the top spin drive and the side spin drive have an effect on the advancement of table tennis play. Another aim is to find

whether psychological stress during the play has an effect on the control of top spin and side spin strokes(shots).

The subjects were 16 Saudi players, who were not familiar with the strokes (shots) they were to learn, especially top spin or side spin drives. They were divided in two groups: The experimental group and the control group. Before the experiment, some variables were set concerning the experiment, and trial proposals were made on the settlement of the experiment.

The period of the training was sixty seven continuous days, with final plays at the end of the training period. When the training had finished after a period of 55 days, the proposals of the research were verified; the findings are as follows:

1. There is a positive correlation of statistical significance between the skill in top spin drives and side spin drives and the advancement of table tennis play.
2. There is a correlation between the proper strokes (shots) of top spin drives and side spin drives and the practicing of Blach shots.
3. There is a positive correlation of statistical significance between the disengagement from psychological stress and the control of spin shots.

(10) TITLE: **Concepts, analysis and regulation of the psychic stress in table tennis**

NAME: SAMULSKI, Dietmar Martin (Brazil)

Key word: Psychology, Stress, Sport, Table tennis

From a psychological point of view, "stress appears when the maintaining or recovering of a favorable situation in threatened. In this concept the personal capacities and possibilities of action are experienced as physical, social or psychic threat or damage"(NITSCH, 1987). GABLER (1987) defines the psychophysiological stress as "a psychic demanding and/or physical load, which is experienced as a hard load, that leads to specific defense reactions aiming at mastering the threatening situation". Furthermore, the stress situations in table tennis can be divided in three phases: pre-competitive, competitive and post-competitive (SAMULSKI, 1981).

The Laboratory of Sport Psychology (LAPES) has an equipment for the adequate and efficient evaluation of the diagnosis and the psychological training of the stress management in table tennis, named BIOFEEDBACK. It can measure the most important psychophysiological functions, which are converted into an acoustic or visual sign, giving the athlete an efficient feedback; furthermore, the laboratory has the possibility to develop, in a systematic way, the following aspects in psychological training: concentration, relaxation an activation training; self-motivation; mental training; "Reframing" techniques training. In conclusion, the psychological training of the stress control in table tennis, aims at developing the emotional capacity, as well as the optimization and stabilization of performance, both in training and in competition.

(11) TITLE: **Psychological techniques of behavior control during critical situation at table tennis competition**

NAME: LIMA, Fernando Vitor (Brazil)

Key word: Sport, Psychology, Table tennis, Stress, Behavior

At high level sport competition, there are many factors which can influence the athlete's performance, such as technical, physical, tactical or psychological ones. A vast number of situation which the athlete would face, might demand these factors on different levels, according to the specific moment. Table tennis in an individual sport, and the player may compete without any cooperation of another athlete of coach in the moments cited above, except at 1-minute-rest intervals between sets.

The critical situations in table tennis competitions are related to those moments when the athlete is submitted to enhanced psychic stress; this condition can be due to the factors cited above as well as to social and environmental ones. These situations will impose upon the athlete a need of a psychological self-regulation, so that the stress does not harm his behavior and performance. It is necessary to identify and classify these critical situations, as well as the systematic and non-systematic techniques of behavior control developed and applied by the athletes, aiming at verifying, through the analysis of table tennis games, the effectivity of these techniques at the identified critical situations.

The purpose of this study is to analyze the psychological techniques for the behavior control in critical situations at table tennis competition.

(12) TITLE: **A biomechanical study on movement of forehand top spin stroke in table tennis**

NAME: YOSHIDA, Kazuto, IIMOTO, Yuji, ANDO, Shintaro (Japan)

Key word: Forehand, Top spin, Drive, Motion analysis, Grand reaction force

Forehand top spin stroke is one of the most important basic skills in table tennis. This report provides the results of our studies whose purpose is to clarify the mechanism of the forehand drive stroke in these ten years.

1. Differences in movement on skill levels

Subjects were three trained players, each of whom had an over 8-year career, and three untrained university students. They performed to repeat hitting a ball every one second with forehand drive three times. Their motions were measured by a high speed video tape recorder and a position sensor system. Their grand reaction force for each leg was measured by two force platforms. The timing of the moment of ball/bat contact was measured by an accelerator which was attached at the end of a racket handle. The results are summarized as follows:

1) After hitting a ball, the trained players brought their racket hand near the trunk;

2) During forehand drive stroke, variance of angular velocity of the arm for the trained players at the moment of ball contact was smaller than that for the untrained players;

3) The trained players changed their torque, which was generated by their legs, from positive

to negative at the moment of ball contact. But the untrained players did not synchronize the time of the moment of ball contact to the moment of the change of torque from positive to negative.

2. Grand reaction force for a top Japanese player during forehand drive stroke

This research is based on a top Japanese player, Y. Miyazaki, who was the member of the Japanese national team from '85 to '89. The main method of this study was the same as that of the above. The results are summarized as follows:

1) Moment of the maximum grand reaction force of his right foot and left foot appeared 150 msec prior to and 40 msec posterior to the moment of ball contact, respectively;

2) The weight of his foot shifted from right to left completely balanced at the moment of ball contact. In addition to these studies, we intend to report on the result of our study, "movement of racket hand for top university players in Japan during forehand drive stroke" on this occasion.

(13) TITLE: **A revised method of deciding the order in a round robin tournament**

NAME: HAN Zhizhong (China)

Key word: *Round robin tournament, Deciding the order of contest, Traditional rotation method, Revised rotation method, Principle*

"1" stable reverse-clockwise-method is the traditional method of deciding the order of contest in a round robin tournament and is still in use today. It has many advantages, but also a significant drawback; that is, when the competing teams are odd numbered the "n-1" team is in an unfavorable position. In order to solve this problem, the writer created a better rotation method which not only keeps the advantages of the traditional rotation but also overcomes its shortcomings.

(14) TITLE: **A study of CYX-94 computer draw system for the table tennis championships**

NAME: CHENG Jiayan, ZHANG Yingqiu, SUN Huixiao (China)

Key word: *Computer system, Draw, Table tennis*

The measure of using chance against chance is called "The Draw". It can affect directly the success or failure in a competition. The responsibility of a draw is to resolve the contradiction between "chance" and "control" correctly. By using the method of "chances", we can ensure equal opportunity of each player. By using the method of "control", we can guarantee the results of draw which accord with the International Competition Regulations. The complex characteristic of a draw is that it is not only a very complicated skill, but also a very complicated question of psychology. An ideal draw is that it possesses highly scientific background and abundant confidence. "A Study of Competition Methods for Table Tennis" by CHENG Jiayan, the secretary of the ITTF Technical Committees, puts forward a theory for draw, the mathematical theorem of "the control of draw" and the draw method by cards. These were fully affirmed and recommended

to the world by the late President of the ITTF Mr. Ichiro OGIMURA. These have been successfully used in the World Championships, World Cup, Olympic Games and so on for several times. It has been proved the most scientific method.

"CYX-94 Computer Draw System" based on "A Study of Competition Methods for Table Tennis" by CHENG, Jiayan fully keeps its merits and develops its theory. This system has been successfully used in the 12th ATTC in 1994 and appointed to be used in the 43rd WTTC in 1995. "CYX-94 Computer Draw System" was written by FOXPRO.

This paper makes an introduction to the function and organization of the "CYX-94 Computer Draw System". By analyzing date obtained by the system, the technical features of the system are summed up.

The system will be provided to all table tennis associations of the world during the 43rd WTTC in Tianjin of China.

(15) TITLE: **Technical index of Olympic table tennis gold medal winner**

NAME: LI Zhenbiao (China)

Key word: *Olympic games, Training aim, Win ratio, Table tennis techniques*

The ultimate aim of competing sports is to improve results and make great achievement. To determine training aim can effectively stimulate player's sense of responsibility and enterprising spirit, it can also make every training activity and match completely carried out and realized according to the training aim. Training aims provide the basis for training and match program. Technical index of Olympic table tennis gold medal winner in this paper will supply important reference for coaches and players to determine training aim.

Subject: Olympic table tennis gold medal winner---CHEN, Jing

Methods: Looking up and reading literature; Consulting coaches of national table tennis team; evaluation of section target and statistics by matches.

Results and discussion; Win ratio statistics of 20 matches before the Olympic games are attack after service section 69%, receive service section 49%, mutual attack section 46%.

Win ratio statistics of semi-final and finals in the Olympic games are: attack after service section 61%, receive service section 72%, mutual attack section 49%.

Win of loss of every score is decided by comprehensive abilities of attack after service section, receive service section and mutual attack section. These 3 sections include all table tennis techniques. Different playing style and strong technique have different win ratio in the 3 sections. When players' techniques in the 3 sections compensate one another effectively, good result can be achieved.

Conclusion:

1. Win ratio of attack after service section should be 60-70%, receive service section 40-50%, mutual attack section 50-60%.

2. Players can develop their techniques in the 3 sections equally or develop special techniques to make 3 sections compensate one another.

3. Win ratio mentioned above can be taken as training aim with which to check players' techniques frequently.

(16) TITLE: **An analysis of the characteristics of the main skills performed by excellent chop-and-attack players and a discussion of their uses of these skills**

NAME: WU Xiuwen, TANG Jianjun (China)

Key word: Excellent chop and-attack player (ECAP), Main Skills, Chop skills, Uses of main skills

Based on the needs of the teaching and training of table tennis, we used a TV image creation system of the SMC-70GP computer to analyze the characteristics of the main skills performed by ECAPs, such as Liang Geliang, Chen Xinhua and Tong Ling, and to study how these skills were used in their games.

In this study, the characteristics and the uses of the following main skills performed by ECAPs were analyzed and discussed:

1. Forehand chop skills, including chopping different kinds of loops, fast drive balls, backspin or nonspin balls, etc.
2. Backhand chop skills, including chopping different kinds of loops, middle balls, etc.
3. The skills of returning the short balls.

The findings show that if chop players have the abilities to counterhit and chop different kinds of loops and continue to develop their new skills, they will get better performances in their games.

(17) TITLE: **Analyses of Chinese excellent table tennis attacking players' service techniques and research of their utilizations**

NAME: WU Xiuwen, ZHANG Zhen (China)

Key word: Service, Microcomputer, Swing attack after the service

A service is an important technique for all kinds of play. We used an advanced microcomputer (SMC-70GP) to analyze service techniques and their utilizations of Chinese excellent table tennis players-- Xi, Nenting, Guo, Yuehua, Jiang, Jialiang, Cao,Yanhua, Cheng, Longcan in this paper. For instance, their backhand fast--top spin--long service, backhand rightside top spin and backspin services, backhand high-toss service, forehand services with high-spin and nonspin, forehand leftside top spin and backspin services, pivot forehand high-toss services and so on. It is suggested that every player must put emphasis on one or two sets of skilled services based on grasping all kinds of service and adapted to his/her own play to form and individualized style.

(18) TITLE: **A comparative analysis of the strike movement component key element in Chinese and British table tennis theories**

NAME: TANG Jianjun (China)

Key word: China, Britain, Table tennis, Comparative analysis of the strike movement component key elements

This paper uses the acquisition theories of sports skills and the mutual restriction theory of table tennis as the basis for comparative analysis. It tries to expound similarities and differences in the notion of strike movement component key elements and their dividing in China and Britain.

The purpose is to help people get a preliminary knowledge of this notion in British table tennis and to help people get a new view of the striking movement component key elements in Chinese table tennis theories so that this notion can be used more scientifically in table tennis teaching and training.

The result of the analysis shows that the Chinese way of dividing the striking movement gives better treatment to the relation between the completeness and the partialness of the striking movement, and it makes it convenient for the learner to understand the relation between the component elements of striking movement.

The British way of dividing the striking movement can provide us with a more detailed and specific method when we explain, show and analyze certain component element of the striking movement. Therefore its role is especially obvious in consolidating the correct striking movement and correcting the wrong one.

(19) TITLE: **The expert system of the Republic of Slovenia for orientation of children into table tennis**

NAME: KONDRIC, Miran (Slovenia)

Key word: Children, Table tennis, Selection, Orientation, Expert system

The orientation of children into table tennis is in Slovenia based on the expert system for the initial selection and orientation of children into sports, which has been gradually introduced since 1989. The data for the system are gathered by the Information System SLO-FIT, which includes most of the school children (more than 300 thousand) of primary and secondary schools of Slovenia.

The data about their morphological status and basic motor space of the anthropologic status are at present used for advising school children into 16 different sport disciplines. One of these is table tennis. In the year 1994 we found more than 20,000 pupils talented in sports (more than 1500 talented for table tennis). The whole process of advising school children into sports is based on the expert system which was developed as a part of the project. The paper presents the professional, methodological and organizational aspects of the expert system for the orientation into sports, especially into table tennis.

(20) TITLE: **Discuss the rhythm and rhythm change of table tennis**

NAME: ZHANG Zhijie (China)

Key word: Rhythm, Rhythm change, Rhythm Training

1. Basis of theme selection: Every sports event has its own specific movement rhythm. The sound Ping Pong by hitting the ball reflects the rhythm of table tennis. Big changes in table tennis rhythm happened 3 times with instrument and technique innovations, namely the 1940's chop of slow rhythm, the 1950's Japanese long drive of relatively fast rhythm and the 1960's Chinese fast attack of fast rhythm. In the 1970's European learned loop from Japanese and speed from Chinese and developed loop techniques. Different playing styles permeate and supplement each other. This enriches playing style and makes table tennis rhythm complex and changeable.

2. Research method: Selecting 10 games from video tape of the World Table Tennis Championships and the World Cup. Every ball was noted, 2836 datum were recorded and analyzed statistically.

3. Classification, concept and definition of table tennis rhythm: The rhythm of table tennis is, beginning from service, players at two sides playing the ball alternately till one side muffs a ball, a regular succession of weak and strong, long and short phenomena. The rhythm of table tennis includes the rhythm of the ball and the rhythm of the player.

4. How is the rhythm of table tennis formed: The rhythm of table tennis exists in the techniques of table tennis. It is the reflection of rhythm to grasp time and position of space, to control the angle of the bat and power and to select the optimal hitting point.

5. The rhythm change of table tennis: The rhythm change depends on hitting time, power, curve, spin and bat.

6. Discussion about rhythm training: There are 3 principles and methods for rhythm training.

7. Main research results:

(1) Having put forward the method to measure the rhythm with time.

(2) Having made detailed description classification and definition of the rhythm of table tennis;

(3) Having put forward the principles and methods for rhythm training.

(21) TITLE: **It's time to raise the height of table tennis tables**

NAME: SCOTT, Michael James (USA), DOLINAR, Zarko J. (Switzerland)

Key word: The height of table tennis table

Based upon several factors I have arrived at the conclusion that the height of table tennis tables should be elevated approximately two inches (approx. 5 cm).

ITTF Secretary General Albert Shipley confirms that the table height has remained constant at 2'6"(approx. 76 cm). Mr. Shipley's records go back to the 1930's. To be technically precise, Mr. Shipley points out that until 1937 the printed table tennis laws only mentioned 2'6" but in 1937 the figure 76 cm was added in brackets. Since 1975 the measurements have been expressed only in metric terms (e.g. table tennis height of 76 cm). A centimeter is actually 0.3937 of a linear inch.

From the 1930's to the present date the worldwide average height of males and females has considerably increased by several inches. Therefore it is only logical that some consideration and compensation should be seriously considered in adjusting the table height accordingly.

(22) TITLE: **Reasonable improvement of bat mold will urge table tennis game to develop toward high level and extensiveness**

NAME: LIU Weizeng (China)

Key word:

Tool improvement may cause a leap in technology. Improvement of bat covers has given huge impetus to international table tennis game techniques. However, several bat molds in practical use almost haven't undergone any big change since the first Championships, mainly because of people's custom, although the regulations have no restriction on shape, size and weight of the bat. Reasonable improvement of bat mold will enable players to make full use of physical power, to reduce training period obviously, to increase the length of rallies, to attract more people to participate in this sport, and thus to urge table tennis to develop toward high level and extensiveness.

The author thinks that reasonable improvement of bat mold is very essential. From 1986 to 1988, the author designed a totally new mold bat, namely "Vice-gripped button buttress bat" according to bionics, which is completely different from the shake-hands grip and the penhold grip in current use. It has the button buttresses which are vertical to the bat surface, instead of usual handle. This won the authority of patent from China National Patent Agency on May 17, 1989. The new bat is very nimble in practical use, just like the player's hand. The tests indicate that it extremely simplifies exiting strike actions, has some advantages of both the shake-hands grip and the penhold grip, greatly enhances backhand shot ability and obviously shortens the training period to become expert.

In November 1978, the author also designed a new bat, namely "Penhold slant handle base" for traditional penhold players in many Asian countries and areas. From October 1979 to March 1980, "Penhold round/square base" had been designed by the author. These bats are sure to be advantageous to players' sport skills. The author is willing to introduce these new bats to international colleagues and friends with the hope of enhancing the development of table tennis.

(23) TITLE: **Estimation of racket speed by ball-traveling distance in table tennis smashes**

NAME: HIRUTA, Shuichi, YOSHIDA, Kazuto, IIMOTO, Yuji, SHIMAOKA, Midori, TAKEUCHI, Toshiko, YUZA, Nobuo (Japan)

Key word: *Smash, Racket speed*

The speed of a racket and the distance which a ball traveled in forehand and backhand smashes were measured in 17 men and 28 women table tennis players aged 10 to 22 years. Subjects

performed ten trials for each kind of smash. The range of the speeds at impact with forehand and backhand smashes were 15.3 to 21.6 m•sec^{-1} and 13.1 to 23.2 m•sec^{-1} for men, and 13.9 to 20.7 m•sec^{-1} and 11.3 to 20.2 m•sec^{-1} for women. The range of the distance of the ball with forehand and backhand smashes were 7.6 to 11.3 m and 7.5 to 10.2 m for men, and 7.7 to 10.1 m and 6.4 to 9.5 m for women. The correlation coefficients ($r=0.74$ to 0.92) were statistically significant ($p<0.05$) between the racket speed and the ball distance. According to the regression equations, 1-meter increment of the ball distance corresponded to the increment of 3.8 to 4.8 m•sec^{-1} of the racket speed. The results indicate that the racket speed can be estimated by measuring the ball-traveling distance of a ball travel.

(24) TITLE: **Studies on the velocity of the ball and the accuracy of various strokes in table tennis**

NAME: KASAI, Junichi, MORI, Takeshi, WATANABE, Masayuki (Japan)

Key word: Forehand strokes, Elbow angle, Control, Speed

The purpose of this study was to investigate the velocity of the ball and the accuracy or forehand smash strokes in table tennis, especially in the aspect of the motion of an elbow joint during each stroke. Four male subjects participated in the experiment on this study. One of them was Guo Yuehua who was the winner in the World Table Tennis Championships of 1981 and 1983. The others were the members of the table tennis club of Waseda University. The pictures of the motion of an elbow joint and the action in hitting were recorded by a video cassette recorder while the motion of an elbow joint was recorded in an electric oscillograph in synchronism with a video signal.

The results obtained were as follows:

1. Guo Yuehua with the highest accuracy of forehand smash strokes showed the lowest deviation of the motion of an elbow joint and degrees of an angle of an elbow joint at impact during each stroke.
2. Guo Yuehua stroked the ball with his elbow join fixed from 20msec before impact to the moment of impact.
3. Guo Yuehua's motion of an elbow joint during smash strokes was same at each hitting point and it stretched widely before impact and flexed sharply and widely after impact.
4. The average degree of an angle of an elbow joint at impact ranged from 108 to 115 at each hitting point of each subject.

From the above results, the following conclusions were obtained:

1. It was guessed that the accuracy of the motion of an elbow joint during smash strokes at each hitting point had a close relation to levels of skill.
2. It was guessed that to stretch an elbow joint before impact, to flex it sharply and widely after impact and to fix it just before impact (ranged from 108 degrees to 115) increased the velocity of the ball and heightened the accuracy of smash strokes at each hitting point.

(25) TITLE: **Researching the mental factors which affect the technique's level on Chinese elite table tennis players**

NAME: TAO Zhixiang (China)

Key word: Cognitive mental factor, Neurotype athlete, Correlation, Validity of measurement

Eleven cognitive mental factors and neurotypes were used to test 68 Chinese male table tennis players with different skill levels and games (fast-attack and loop games).

The results show that elite athletes are better than non-elite athletes in four of eleven cognitive mental factors. Furthermore, these four factors have different contribution to the skill levels, depending on the game of the athlete.

The result of neurotype test showed that there are different characters of neurotype in different skill levels and games of the athlete. The active type and the calm type are very popular in elite athletes.

(26) TITLE: **Long term effects of table tennis on the health related fitness in "mama-san" (housewives) players**

NAME: KOBAYASHI, Yoshio, HOSOI, Teruo, TAKEUCHI, Toshiko (Japan)

Key word: Cardiovascular fitness, Bone stiffness, Plasma Lipoproteins

Recreational sports have become increasingly popular in today's society. Large numbers of people have taken up a variety of sports and have now been exercising for many years. "Mama-san" table tennis is one of the popular sports for fitness and recreation in this country. It is of considerable concern whether long term table tennis activity can enhance the beneficial effects on the cardiovascular and musculoskeletal systems of middle-aged woman.

A total of 40 middle-aged women, all housewives (10 table tennis, 10 volleyball and 10 jogging athletes, and 10 sedentary people as control) volunteered for this study.

Aerobic fitness was measured during an incremental treadmill test to voluntary exhaustion using the Balke protocol. Maximal oxygen uptake was determined as the highest V_{O_2} value.

Ultrasound of the calcaneus was measured with the Achilles densitometer (Lunar Corp.). With the densitometer, the foot is placed in a water-bath for approximately 3 min. The Stiffness Index (calculated by the computer program provided by the manufacturer from the combined data of speed of sound and the broadband ultrasound attenuation) was recorded to give the bone density.

Strength (average peak torque and total work rate) of the knee Extensors/flexors was evaluated with Cybex 350 Isokinetic Dynamometer (Lumex Corp.). Strength testing was performed at angular velocities of 120, 180, and 240 per second.

A venous blood sample was drawn from ante-cubital vein for the measurements of total cholesterol, high-density cholesterol and triglyceride concentrations in order to assess their coronary risk.

As an indicator of the body composition, skin fold thicknesses were measured utilizing the skin fold caliper. These measures were taken at triceps, suprailiac, and subscapular sites.

The results will be presented and will be discussed in order to find out whether long term table tennis activities can serve to reduce degenerative diseases.

(27) TITLE: **Gynecopathy of elite female players of table tennis**

NAME: GUAN Yan (China)

Key word: Gynecopathy, Pelvic tuberculosis, Polycystic ovary

From 1991 to 1994, there were 10 gynecopathy patients among the female players of table tennis.

1961-94 Pelvic tuberculosis 4
1978 Polycystic ovary 6

The article describes in detail the cause of disease and the symptom of pelvic tuberculosis and polycystic ovary. Ten female players were treated. Relevant measures were taken and tracking observation was made.

(28) TITLE: **Acquired immunodeficiency syndrome (AIDS) and table tennis**

NAME: SCOTT, Michael James (USA), DOLINAR, Zarko J. (Switzerland)

Key word: HIV, AIDS

The human immunodeficiency virus (HIV) infection has reached world wide epidemic proportions. It is estimated that over 17 million have been infected since the beginning of the pandemic in the late 1970's. It is also estimated that 4 million AIDS cases have occurred worldwide.

The World Health Organization predicts that by the end of the century the global total of HIV positive people will be 30 to 40 million. The most dramatic expansion will be in Asia where it is spreading faster than anywhere else in the world.

The condition is practically 100% fatal; there is no known cure; and no cure is in sight. In the Unite States it is the second most common cause of death in males 25 to 44 years of age.

HIV transmission in sports is a factor that must be considered. Table tennis players have been affected. In table tennis some basic precautionary measures should be instigated to minimize exposure to this deadly transmissible virus. To do nothing would be irresponsible. Such a measure will be presented at this conference.

(29) TITLE: **National leagues and world ranking**

NAME: ERIKSSON, Peter (Finland)

Key word: National leagues, World ranking

Thinking about racket sports as a whole, one realises that lawn tennis gets more than 90% of all the attention, glory and money. Don't take that as suggestion that I am envious of tennis. On the contrary, I feel admiration for that racket sport and how it has been professionally handled. However, table tennis, the most played racket sport in the world, is closest to many of our hearts.

In a recent discussion with my good friend Mans Holmberg, one of the youngest International Umpires, we came up with some constructive ideas for how international table tennis might be further promoted. Let us start by analysing some of the differences between lawn tennis and table tennis which could help us to understand the different status of these sports. Of these differences I should like to point out the money, the ranking system and the mode of competition.

Money is what makes the world go round, in sports as well as elsewhere. Tennis has attracted the big money with the inevitable consequence of great media coverage and public interest. Obviously every factor which brings in more money to table tennis also would promote out sport.

A logical, positive, up-to-date ranking list is essential. Tennis benefits from having one which is based on an enormous amount of different classes of competitions. The positive reinforcing attitude to participation in competitions derives from the fact that no special penalty results from losses; you can only win, not lose, by participation. Table tennis, as well as badminton, is still suffering from this way of judging. The problem has recently been recognised in table tennis in an article in Digest No 19 by Andre Damman, the Chairman of the ITTF Ranking Committee, and improvements are, hopefully, on their way.

The big problems of ranking in table tennis are the basic logic and the way to keep it up-to-date. The top 40 players are relatively well ranked because they will usually have ample chances to meet each other in the few competitions with ranking value. Beyond these players, however, there is unbelievable chaos, with players being ranked arbitrarily because they will not score enough points in the few competitions available to them. This also was apparent in the excellent article by Damman.

The mode of competition is very different in lawn tennis and table tennis. In table tennis there are relatively few open competitions with ranking value, but instead a huge number of very prestigious leagues in different countries. The matches played in these team events have no international ranking value, in spite of the fact that real professionalism exists here. The idea for the future is that every country would have the possibility of applying for international ranking value for their premium national league matches. For this right, the Associations should pay the ITTF a suitable sum of money. This arrangement would have the following advantages:

1 More matches would be note, which makes for a more meaningful ranking list.

2 More players would be noted. In top nations many players who have not made the national squads but who are of high international calibre do not have much opportunity for participating in open competitions. The new system would give the players a fair chance to approach their true positions in world ranking.

3 The ITTF would receive additional income, part of which could be used for special international events which would further promote the status of the sport.

4 Players would feel that their own rights were better acknowledged and this would bring additional attraction to the sport.

5 The emphasis on the premium league matches in many countries would become stronger,

which would promote the national leagues and correspondingly increase the interest for the public and the media.

6 the new system could easily bring national sponsors to the leagues and thus further promote the sport.

Hopefully, the ITTF could make a move on this question during the spring of 1995 so that improved ranking rules could be applied from the start of the 1995-96 season.

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