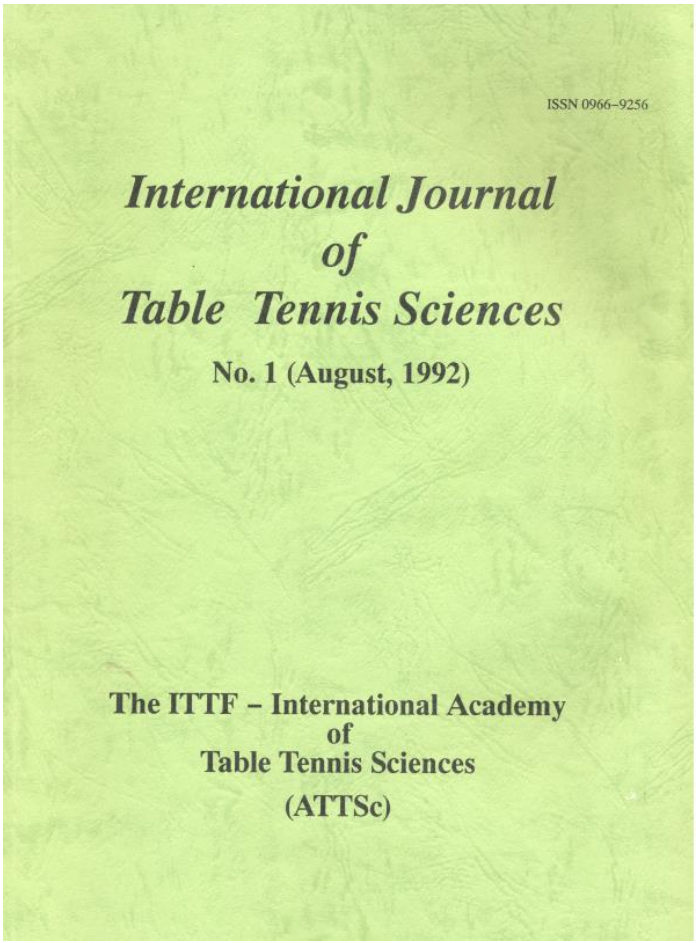
BOOK OF ABSTRACTS – 1991

NOTICE!

In front of the 2nd ITTF Sports Science Congress Book of abstracts was not published but it was included in first issue of the International Journal of Table Tennis Sciences



ISSN 0966-9256

International Journal of Table Tennis Sciences

No. 1 (August, 1992)

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

Opening Ceremony at *the 2nd ITTF Sports Science Congress*

Opening Speech

Ichiro Ogimura

The President of the International Table Tennis Federation

On behalf of the International Table Tennis Federation, I would like to heartily welcome you to the 2nd ITTF Sports Science Congress, and express my sincere gratitude to Mr.Bungo Matsukawa, Honorary Patron of this congress, for his enormous contribution to the success of this congress.

The scientific study of table tennis is a very important issue. But it has not reached its full potential in comparison with other sports, because table tennis has the most sophisticated actions and tactical moves of all sports.

I believe your efforts and support for table tennis may boost our sport further and help our players and coaches to increase efficiency in the use of their precious time and energy, thus promoting our sport in the World due to better sporting results.

I wish you good health and a pleasant stay in Japan and I hope you enjoy the meetings ahead.

Invitation Speech

Bungo Matsukawa

The Chairman of the Saitama Institute of Technology

It is with great pleasure that we hold the Second International Table Tennis Federation (ITTF) Sports Science Congress in April, 1991, here in Saitama, Japan. The data of this congress just precedes that of the 41st International Table Tennis Championship at Makuhari, Chiba.

The scope of congress is to provide a forum for discussions on the physical training, health, and psychology of athletes in general and on the scientific and technological approach to the table tennis game. We expect that multidisciplinary research interaction will be the most prominent feature of ITTF sports science. And we hope that this congress leads to the foundation in Japan of the International Society of the Table Tennis Sports Science for the collection and exchange of research materials.

The congress site is Saitama Institute of Technology which is located in the northern suburbs of Tokyo. Participants will enjoy visits to places of scenic beauty and historical interest as well.

To promote international goodwill and to facilitate discussion of the table tennis sports science, we cordially invite you to the Second ITTF Sports Science Congress.

Welcome Speech

Shuichi Suzuki

President of Saitama Institute of Technology

Good Morning! Ladies and gentlemen!

On behalf of Saitama Institute of Technology, it is a great privilege and honor for me to welcome you to the 2nd International Table Tennis Federation Sports Science Congress.

I would like to extend my hearty welcome especially to those who have come from distant overseas countries such as Switzerland, France, Netherlands, England, Mexico and the others to attend this congress.

I hear that the first congress was held in Rome, Italy, 1989. This is the second congress in Japan. We are very happy to be able to see you here in Saitama. Prof. Yuza and the organizing committee did their best to make this fully successful and fruitful.

I think the main purpose of the congress is to promote the international cooperation on the sports science of table tennis. After the opening addresses, today, there are three keynote addresses in the morning, where you will have papers on medical, sociological, and physiological studies in the morning, and biomechanical, psychological and training studies in the afternoon. Furthermore, you will have the proposition for the new Academy and the sectional meeting on Tuesday. I think that this congress is a very unique and important congress on the sports of table tennis.

Our Institute was established in 1976. We have three engineering departments of, such as mechanical engineering, environmental engineering and electronics engineering. Additionally, we offer two courses, fundamental engineering and human science. The number of undergraduate students is about 1,500. This is not so big. So, we have a very unique educational system. That means human harmonious relation with Buddhism spirit. Furthermore, recent research works have been very active in the fields of new materials, biotechnology, electronics and mechatronics.

By the way, I am an applied biochemist. I have done much research work on the determination of many substances with biosensor system over the last 20 years. So, I am very interested in the papers of evaluation of table tennis practice by blood lactate concentration and plasma testosterone levels in freshmen of a college table tennis team and so on. I hope that you will make the most of the congress not only in the keynote lectures and presentation of contributed papers but also in various personal contacts and discussions among the participants. Especially, I hope you exchange ideas and promote friendship during the congress.

I believe that the congress contributes to the dissemination of table tennis practice and provides inspiration to young people to master the table tennis.

Now, we have a pleasant spring season. It is a fine day in the morning. The cherry blossoms are all over. But I hope you will have time to explore our country. I would like to take this opportunity to record our thanks to Mr. Ichiro Ogimura for undertaking the arrangements which have made this congress possible at our Institute, here in Saitama. I hear that the next congress will be held in Acapulco, Mexico in 1993.

Finally, I am sure that, in turn, the congress will continue to contribute toward greater cooperation and deeper understanding between Japan and the nations of the world.

This concludes my talk.

Thank you.

Summary of Keynote Addresses at *the 2nd ITTF Sports Science Congress*

Practical and Scientific Investigations, Experiments, and Conclusions after Four Decades of Active Participation in Table Tennis

Dolinar, Z.J.

I am very happy to initiate such a congress as this. This congress will mark another era in our sport, i. e. table tennis. During the fifty-five years of my participation in this sport, I have witnessed great progress and several era making events in table tennis. Though at first we had only primitive bats and tables and few spectators, we have developed our sport, promoted it, and introduced it to Japan, Korea and other countries until we reached where we are today.

Indeed these achievements of ours are creditable, but we must go on making something new instead of staying here complacently. Plato, the founder of the first academy, said that all people, especially philosophers, were not satisfied with the world in which they lived. And I know it is unsatisfied people that have made changes in history. It is the case also with our sport.

We should not be satisfied with the status quo. for example, room for improvement is to be found in (1) the educational system,(2) professionalism, (3)lack of humanism, and (4)materials and playing circumstances with the scoring system included.

Educational System

We hold the responsibility for the future of table tennis in that we are in a position to educate younger generations. We have to produce nice, positive youth: not only physically but also mentally sophisticated players. And sports are very good circumstances for education because in the world of sports all people can enjoy fair chances and equal opportunities. Equally important, in a time of competitive politics and economy, a sport is the only place where you can learn how to lose.

Materials

(a) bats: many players have lost a lot of points, hitting a ball with the brim of a bat. It might be a solution to it if we introduce bigger "jumbo" bats. I request that specialists investigate the gap in air resistance between jumbo bats and ordinary bats.

(b) grip: The prevailing way of gripping a bat seems to me somewhat illogical or irrational. We should find out a surgically sound way of gripping.

(c) tables: I personally believe that the tables we are now using are to small for our sport to reach the level where other more advanced sports stand.

(d) nets: The net is the greatest enemy against table tennis players, and for that matter lawn tennis players. The crucial problem with it is that it seldom runs straight along the base-line, giving one player advantage and the other disadvantage. Some measure must be taken to rectify this injustice.

(e) scoring system: the scoring system in use at present does not seem logical, sensible, or appropriate: counting up every point makes players nervous and leads even the greatest of them to make mistakes which otherwise they could avoid easily. A system of counting every two points or a more drastically improved system is necessary for us to set up playing circumstances where players can fully show their abilities and skills, and where anxiety does not play a part in deciding the outcome of a match.

The Efforts to improve materials are also the attempts to eliminate, if possible extinguish, anxiety in players' minds. Anxiety does nothing but harm to what I personally call "the fifth dimension" i.e.the human factor. We cannot place too much value on the fifth dimension, against which anxiety is a crucial enemy. Anxiety makes nerve systems stop working.

Some might laugh at the immense energy and enthusiasm we dedicated to our sport and our academy. But it takes all sorts of ideas to make a world. We have to go on producing something new.

Last but not least, we gratefully acknowledge the assistance of Saitama Institute of Technology in the administration of this congress.

Reflections about the Importance of Table Tennis Equipment on the Velocity of the Ball, on the Psychological Wellbeing of Top Players and on the Image of Table Tennis with General Public about the Organization of Related Scientific Research

Paul Schiltz

TABLE TENNIS: AN ATTRACTIVE SPORT FOR INSIDERS OR / AND FOR GENERAL PUBLIC?

The image people have or give of our sport depends on their relationship with table tennis.

The insiders develop an otherwise rare passion for this most sophisticated, high-tech [4], speedy and spinny sport, which belongs to the 12 most popular sports [12], which is played by 250 millions of people all over the world [10]. In most countries the famous and lovely "word" ping-pong has been banned [4]. Insiders present table tennis as a sport which bears secrets [9], which needs a long and difficult apprenticeship for it associates a complicated, often automatised [1,11] technique, many precise gestures [36], small response-time [39], the most elastic ball to the smallest playing area [43] however becoming too wide with reference to the high velocity [1], which allies elegance with aesthetics [13], which is close to art [1], was an harmonica is now a violin [64], which asks for highest endurance and heart-performance [44]. Table tennis game is characterised by lowest reaction-times and highest anticipation rates [1], but is often ruled by an inflexible, immovable however optimistic conservatism [45,59] saying (equipment-) changes not necessary [48]. All this sounds very paradoxical, for at the same time everybody agrees that table tennis must be given more mass appeal [49,63], become one of the five major sports [58], get more attractive [60].

The general public and the media commentators however seem to have a different view of table tennis as insiders have. Some still nowadays stick to a statical, lazy, sissy [67] ping-pong, the other more interested people argue against complaining about a leck of visibility, attractiveness, athletics, continuity, understanding of what happens at TV. So the ball is too small, the floor is too clear! The velocity of the ball, the racket twiddling and the tricky, high toss short services degrade the opponents and the general public to helpless statists [4] and hook an undesirable tinge of magic [66]. The rallies are too short [54,74], the real playing-time is about 10% [64]; TV makes not use enough of interruptions to enter explanations and low-speed [60].

Thus, in our sport permitted reaction time has now reached "inhumanly" low values, necessary concentration for the game has "superhuman" traits, spectators and media commentators remain "confused". This evolution achieved at enormous expense and with admirable ingenuity risks propelling table tennis into realms of myth and mystery (for general public of course).

FIGURES, SOME WITH QUESTION MARKS

BALLS *diameter = 38 mm* *weight = 2,5 g* *material = celluloid*

Speed : 10 to 180 km/h i.e. 3 to 50 m/s Spin: -130 to + 170 rev/s [1,2,10,11,12,33,52,56]

Stroke	Translation speed range m/s	speed maximum	Rotation rotational speed range rev/s	maximum
Block/Counter	06 to 18		+20 to + 40	
Smash	18 to 30	50	+ 0 to + 60	+85
Topspin	12 to 20		+110 to +140	+168
High loop	10 to 15		average +146.8	pimple-in +168 pimple-out +147
Forward loop	15 to 30		average +134.5	pimple-in +149 pimple-out +134
Push	04 to 08		-20 to -60	
Chop	06 to 10		-20 to -130	-120

ARM AND RACKET [1,10,11]

	arm	racket
playing short balls	1.5 to 5,5 m/s	a maximum up to
playing middle balls	5.5 to 11 m/s	+ 30% in comparison
playing smashes	11 to 19,5 m/s	to the arm

IMPACT BALL-RACKET [10,11,12,33]

contact-duration < 1 ms on a distance of 0.2 to 0.5 cm (pushes) and of 0.5 to 1.0 cm (smashes)

force acting onto the ball is up to ? 10000 N; its deformation is up to 50% of ball-diameter

IMPACT BALL-TABLE [12,33,35]

contact duration<1ms ? ; loss of translational speed = 2m/s ?; changes in spin = + 20-25 rev/s ? (for both topspin or chop)

RESPONSE- AND REACTION-TIME OF PLAYERS

- Middle-class sportsmen: 0.25 s

  Top-players: to an optical stimulus 0.18 s - to an acoustical stimulus 0.14 s [10]

- During a 0.2 s period a ball with a speed of 40 m/s covers a distance of 8 m! Only additional anticipation allows the player to catch the ball: experienced players start their reaction 0.15 to 0.2 s before the ball-racket impact [40]

- Duration of a one-return rally = 0.4 to 0.5 s at high speed, 1 s at lower speed [8,9]

ABOUT THE VELOCITY OF A TABLE TENNIS BALL

The velocity is the most exciting but also the most complex and problematical aspect of our "magic ball". The translational and the rotational velocities of the ball, their origin, their changes and their effects during impact may suggest investigations on four levels:

1. Features of celluloid, statical and dynamical behaviour of a table tennis ball
2. Impact racket-ball, the origin of speed and spin
3. Curved track of the ball
4. Impact ball-table and changes in trajectory, speed and spin

ad 1. The specifications of weight, size and overall sphericity are fundamental quality-criteria and can easily be measured. The determination of the total sphericity by measuring the veer already is more tedious because of a random choice of ball start position [89]. The bounce of a ball which falls down from a height of 305 mm shows no correlation to the stiffness of the ball: a "soft" ball half can have a good or a poor bounce, a "hard" ball half idem [85]. Thus, will stiffness and elasticity always stay independant whatever may be the experi-mental parameters, i.e. higher momentums, different impact-angles, static or dynamic testing? Until now we know that the stiffness of the ball grows with the thickness of celluloid [84], remains the same even after 20 indentations and decreases for deeper indents, that total cancelling of a 2 mm indent takes about 0.3 s[85],

ad 3. A *nonrotating* ball flying through the air is opposed a drag force (D) due to friction between molecules i.e. viscosity (η) of the air ("friction-drag") and, at higher velocities, due to a shedding of vortices i.e. a lower pressure at the rear of the ball ("pressure-drag"). A *rotating* ball flowing through air encounters an additional force, the (Magnus) lift ($\mathcal{L}$) which acts perpendicularly both to the directions of rotational and translational velocities [9,55]. The reason is a nonsymmetric vorticity, thus a lower pressure (Bernoulli) upwards, downwards or sideways at the rear of the rotating moving ball.

Plenty of research data tell us what happens to balls in "free" motion: joggling [76], golf [79], base-ball [78], tennis [80], table tennis [2,38,40,56]... They reveal the dependancy of the trajectory on static ball-parameters

(weight, radius, surface finish or roughness), on dynamic ball parameters (translational and rotational velocities), on parameters concerning the air (temperature, pressure, humidity) and the type of fluid flow (steady, nonsteady, turbulent).

The trajectory of a "rigid, smooth" table tennis ball (velocities: $4<v<50$ m/s resp. $0<\omega<160$ rev/s) through the air considered as an "incompressible fluid flowing laminarily" (Reynolds' number: $10^4<Re<1.3\cdot10^5$) was determined by 3D-chronofotography [2,38] and simulated by computers [2]. The results are [2]:

1. The magnitude of rotational velocity only decreases 3 to 5% for a ballflight lasting 0.5 s.

2. The frequencies of vortex shedding increase with the speed of the nonrotating ball. At a very low speed, "floating motion" remains theoretically possible, but was not detectable.

3. The very important deceleration (up to $-100 m/s^2$) of table tennis balls (which have a low weight relative to a big diameter) abnormally decreases the drag coefficient $f_D = 2\cdot D/\ \rho\cdot v^2\cdot A$ (f_D depends on the object shape or cross section $A = \pi r^2$ and on the fluid ρ = density v = flowing speed, so f_D is a function of $Re = 2r\cdot\rho\cdot v/\ \eta$). This means that a table tennis ball is more "nimble" than other spheres.

4. The pressure drag gets up to 50% higher for a rotating ball in comparison with a nonrotating ball: such a ball moves more slowly. However at high spin ($\omega>100$ rev/s) and high speed, the drag coefficient quickly falls down to the values of a nonrotating ball.

5. Lift coefficient f_L increases with higher spinparameter SP ($f_L = 2\ L/\ \rho\cdot v^2\cdot A$, $Re_{rot} = \rho\cdot r^2\cdot\omega/\ \eta$, $SP = u/v$).

These observations underline and explain the evolution table tennis has taken in the last 10 years: high spins in association with high speeds are available [2,56]. At $\omega = 150$ rev/s we even become highest f_L for lower f_D: is the flow of the boundary layer getting turbulent? However that may be, table tennis balls go faster and faster.

N.B. The total kinetic energy K of a rotationg ball flying through the air will be (angular speed $\omega = u/R$, u = linear speed of a point of the ball, M = mass or translational inertia of the ball, $I_{cm} = 2/3\cdot MR^2$ = moment of inertia of the ball, R = radius of the ball.): $K = 1/2\ I_{cm}\ \omega^2 + 1/2\ M\ v_{cm}^2 = 1/3\cdot M\cdot u^2 + 1/2\cdot M\cdot v^2$

ad 2 and 4: If 2 rigid bodies collide, translational and rotational motions change abruptly.

The collisions of a table tennis ball are elastic at a certain degree only. The loss of translational energy during the impact on table can be written (for a heavy, unmovable table): $\Delta W = 1/2\ m_{ball}(1-k^2)v_{ball}^2$.
The angle of reflection and the coefficient of restitution ($k = w/v$) i.e. the direction and the magnitude (w) of translational final velocity depend on the angle of incidence and on the incident speed (v). Because of the frictional forces during impact of a rotating ball, the translational velocity will be affected [83]. Experimental measurements are necessary to draft all those correlations.

Every accelerated body must have a force acting on it. In translational mechanics the equation for impulsive force is written $F\Delta t = M\Delta v$, in rotational mechanics $\tau\Delta t = I\Delta\omega$ (τ = torque or moment of the force $F = F\, r_{\perp}$ where $r_{\perp}$ is the moment arm). During the very short time duration of the collision, the impulsive force acting onto the ball is high, the relative magnitudes of its tangential (F_t) or normal (F_N) components depends on the angle of contact. Because of the frictional forces ($f = \mu \cdot F$), F_t generates torque τ (=spin), F_N (=the load) assures a high magnitude for the frictional forces [91]. The magnitude and the direction of both F_t and F_N decide the final velocity of the ball. Besides the skill, the ability and the know-how of the players, hardness, elasticity and friction coefficient μ of the covering decide on the motion of the leaving ball [11,37,42,43].

Our actual knowledge, through calculations and simulations, enables us quantitatively to predict and to visualize the changes of the trajectories of bigger balls [2,59,60,81]. Our informations about the deformations of balls und rubbers under stress, about rolling or/and gliding during a collision however are as hasardous as those we have about durability and bounce of thinner, bigger and/or heavier balls. The table tennis ball is such a highly sensitive and frail being, that it is important to seriously extend our actually rather incomplete knowledge about the prenamed topics and to develop, in collaboration with manufacturers and university-labs, reliable and easy test-devices. Existing static and dynamic methods of analysis have to be developed in order to measure and express the strains and deformations resulting from tension or compression stresses (σ) acting normally or from

shearing or twisting stresses (τ) acting parallel onto the surfaces of the elastomer [90]. Valuable but incomplete experiments have been done for balls [84,85] and for racket coverings [82,85,86,88].

Finally, this essay mentions the racket wood with the only intention of warning of including more and more elastic, speedy fibrous layers.

NET HEIGHT AND OTHER INTERESTING SUGGESTIONS

Significantly raising the net (+ 2 cm) gives an advantage back to defendors, reduces service-danger, slows the balls, obstructs the smashes and instead favours topspins [47]. This possibility, perhaps this necessity [74], is opposed by people who are anxious to be disadvantaged [48,64] or by some who think table tennis will become more monotonuous, more inexplicable, thus less attractive [59,66,68].

In order to decide on good grounds, more investigations to find out what kind of strokes are less or more affected by a higher net, more discussions about the effect on learners and middle-class players and more information to the national associations (meetings, video-tapes) may be essential.

In combination with an increase of the net, service-law [60,62,64,75] may be changed to reduce its danger for the opponent, the confusion of spectators and the parallax errors for umpires, and combined rackets may be forbidden [1,30,32,37,48,65,66] for twiddling is a real desaster specially at lower level. The proliferation of racket-coverings whose friction coefficients vary within a rate from 1 (= glassy) to 10 (= sticky) [37,86,87] is in fact a unique situation in sports; nevertheless many people are opposed [64,65,66] to a standardisation.

ABOUT COLOURS

A common discussion topic in table tennis circles today is the colour of the ball, of the tables, of the surrounds, of the floor, or the clothing... [45].

For a table tennis player, anticipation and view, both together, start his (re)action. When white colour strains the eyes, tires the players and makes lines flickering at TV, a yellow ball, well contrasting with background colour, reduces the reaction time, increases the accuracy [40,92] and nearly eliminates the TV-flickering. The human

eye is most, but pleasantly, sensitive to yellow. At high speed the eye is not able to fix and follow the ball, the peripheral sight however records the trajectory; again yellow is best (green, red for instance turn grey) [40,44]. So yellow is the physiological, psychological and technical colour of the future ball.

The colour of the tables and the nets, of the floor, of the surrounds shall give a good contrast with the yellow ball in order to guarantee a perfect visibility and a pleasant image to the spectators in sportshall and at TV [45]. Another important factor will be the intensity and the spectral composition of lights. A very close collaboration with TV-people, with colour-designers and engineers should be useful. The visibility of the scoring devices too has to be considered carefully: why not taking electronic boards showing the score to 4 sides?

PLAYERS' WELLBEING

When the colour, the uniformity and the gloss of the floor or of the mat are certainly most important because of a good presentation of table tennis to general public, its resiliency and its slipperiness should be regarded as most important from the view point of players' psychology, physiology and performance [69,77]. Sport shoes, floors and mats must be designed in order to absorb the shock, to facilitate the starts and stops of the feet and to prevent accidents [50]. Recommendations for special table tennis mats and floors may be according to international level, test procedures to internationally admitted norms [50,69,70,71,72,73].

The top players have a right to be provided with top playing conditions at any ITTF recognized table tennis event. Technical leaflets should define specifications and test procedures for any equipment in use at those events; ITTF Council and Committees should guarantee the adherence to the relevant regulations [46,68].

BETTER COORDINATION THROUGH SCIENTIFIC ARCHIV AND FOUNDATION

In order to succeed at the prenamed challenges, a better coordination of the initiatives in table tennis scientific research is urgent: ITTF needs a scientific archiv and one or two honorary research coordinators. A foundation awarding subsidies to non professional researchers and ordering larger, thus more expensive fundamental research works at specialized labs has to be created.

BIBLIOGRAPHY

GENERAL:

Benedek/Villars. Mechanics. Addison 1974. ISBN 0-201-00551-4

Couarraze/Resnick. Introduction à la rhéologie. Tec&Doc 1983. ISBN 2-85206-195-3

Fleury/Mathieu. Mécanique physique. Eyrolles 1965

Halliday/Resnick. Physics. Wiley 1978. ISBN 0-471-02456-2

Bergmann/Schaefer. Mechanik, Akustik, Wärme. De Gruyter 1974. ISBN 3-11-004861-2

Acheson. Elementary Fluid Dynamics. Clarendon 1990. ISBN 0-19-859660-x

Zebisch. Dynamik. Vogel 1974. ISBN 3-8023-0069-6

Encyclopaedia Britannica 1988

Encyclopédie Internationale des Sciences et des Techniques. Presses de la Cité 1970

Ulmann Encyclopedia of Industrial Chemistry. VCH 1989. ISBN 0-89573-183-5

TABLE TENNIS BOOKS

1 Muster. Tischtennis''Lernen und Trainieren''. Limpert 1986. ISBN 3-7853-1465-5

2 Seydel. Spielbestimmende Faktoren beim Tischtennissport ''Messung und Simulation von Ballflugkurven''. Strauss 1990. ISBN 3-89001-087-3

4 Link. Spielte King-Kong wirklich Ping Pong? Philippka 1990. ISBN 3-922067-75-1

8 Angelescu. Le tennis de table. Vigot 1980. ISBN 2-7114-0779-9

9 Ogimura. Tischtennis. Joola 1973

10 Sklorz/Michaelis. Richtig Tischtennisspielen. BLV 1979. ISBN 3-405-12135-3

11 Hudetz. Tennis de Table Technique. Tibhar 1988.

12 Sklorz. Tischtennis ''Vom Anfänger zum Könner''. BLV 1980. ISBN 3-405-11702-x

13 Butterfly. Tischtennis Geschichte - Butterfly Geschichte. 1980

ARTICLES:

30 Berczik. Interview. TpT 39/40, 1982/83

31 Maillard. Le déplacement. TpT 38, 1981

32 Tréfeu. L'utilisation des matériaux spéciaux. TpT 37, 1981

33 Seydel. La bonne technique du droit. TpT 37, 1981

35 Ormai. Facteurs influençant la rotation du top spin. TpT 34, 1980

36 Weber. Notions élémentaires sur le tennis de table. TpT 21, 1977

37 Roesch. La raquette miracle. TpT 21, 1977

38 Seufert. Mesure des trajectoires et des vitesses des balles de ping pong à l'aide de moyens photogrammétriques. TpT 19, 1977

39 Harangozo Ecole. TpT 13, 1975

40 Franke. Training der Antizipation. Deutsches Arzteblatt 37, 1969

42 Wack Sports. TpT 36, 1981

43 Yamaoka. Les différents types de revêtements. TpT 36, 1981

44 Robert. Vision et pratique du tennis de table. TpT 35, 1981

45 Harrison. The colour of the Future. 1st World Doubles Cup

46 Palecek. Better presentation for more attractive TT. TTR Nov 88

47 Tamasu. The effects of higher nets. TTD N.2, 1989

48 Tamasu. Equipment rules Changes not necessary. TTR Mar 1989

49 Morris. Time of Change. TTN 192, 1990

50 Got. Les chaussures du sport. La Recherche 191, 1987

52 Orfeuil. Les Effets en Tennis de Table - Recherche Expérimentale Chinoise. FTT 493, 1989

54 Orfeuil. Enquête. FTT 372, 1982

55 De la Taille. L'aéronautique des balles. .....

56 Wu Huanquin/Qin Zhifeng. Experimental Research in Table Tennis Spin. Hongkong Table Tennis 1988

58 Ogimura. TTN 196, 1991

59 Hudetz. Warum so konservativ? DTS 1990

60 Bartonietz. Der Tischtennissport muss attraktiver werden. VDTT Symposium. DTS 1990

62 Gäb. Auf ein Wort. DTS 7, 1990

63 Holzner. Auf der Suche nach den Zuschauern. DTS 7, 1990

64 Tamasu/Bowler/Wilkinson. Discussion on more attractive table tennis. TTR Apr 1989

65 Tamasu. Into a new era of dynamic table tennis. TTR May 1989

66 Tamasu/Sawada. Thoughts on Equipment & Rules. TTR May 89

67 Tamasu. I win or I die. TTR Sept 1989

68 Harrison. Let's not rest on our laurels, TTR Nov 1989

69 Yoshioka/Ono. On Resiliency of Gymnasium Floors. Report 3 to Research Lab of Engineering Materials Japan, 1978

70 IAKS Recommendations for Sportfloors, Köln, 1990

71 DIN 18032, Teil 2, Berlin, 1986

72 Les sols sportifs des salles d'éducation physique et sportive. France 1989

73 AFNOR. Détermination des qualités sportives des sols sportifs. Confort et performance. Méthode accélérométrique. Septembre 1990

74 Hardy. Rehaussez le filet. FTT mars 1991

75 Schiltz. The service law. TTD, Nov 1990

76 Graham/Buhler. L'art de jongler. La Recherche 135, 1982

77 Mc Mahon/Greene. Des pistes d'athlétisme plus rapides. Pour la Science 16, 1979

78 Watts. La Physique du base-ball. La Recherche 198, 1988

79 Van Hoeck. La Dynamique du Golf. Science et Vie, juin 1984

80 Durey/De Kermadec. Tous les coups du tennis et leurs effets. Science et Vie juin 1984

81 Durey/Laurent/Journeaux. Avec les micro-ordinateurs, faire de la Physique d'abord. Bull de l'Union des Physiencs France 652, 1983

82 Zgaga/Indof/Hudetz. University of Zagreb. Measurements of elasticity, friction and hardness of some racket coverings. 1982

83 Bickford. How to make the most - or the least - out of impact. Machine Design N.8. 1968

84 Yamaoka. Hardness of balls and thickness of celluloid. 1977

85 Theves/Victor. Untersuchungen an Tischtennismaterial: Bälle und Beläge. Athenaeum und Good-Year Luxemburg 1990.

86 Schöler-Micke. Katalog 1990.

87 Sportschreiner. Katalog 1990

88 Mareau. Contribution à la détermination des forces de frottement de glissement et de roulement lors des rebonds de balles de tennis. Mémoire de DEA, UEREPS Poitiers, 1985

89 ITTF. Technical leaflets. 1989

90 DIN 53535 , 1982 und DIN 53445, 1986. Berlin

91 Su Piren. The Mechanics of Spinning balls.

92 Rogers/McMorris/Morris. Response times of international table tennis players to different coloured balls and backgrounds. 1991

FTT = France Tennis de Table / DTS = Deutscher Tischtennis Sport / TpT = Technique pour Tous / TTR = Butterfly Table Tennis Report / TTN = English Table Tennis News / TTD = Table Tennis Digest

The Problem of doping

Yoshio Kuroda

The merciless rigor of modern competitive sport, especially of the international level, the glory of victory, and the growing social and economic reward of sporting success – in no way any longer related to reality – increasingly force athletes to improve their performance by any means available.

Not least of all is the underlying "national tendency" to increase competitive performance so that victory for one's own country can be attained at any price. Natural and physiological possibilities of improving performance by means of normal training methods and appropriate conditioning have already been largely developed or have not achieved the desired results, and many athletes are neither capable nor inclined to suffer continued deprivation or denial.

It is thus natural that other methods of attaining sporting victory are considered, and it is somehow understandable that the athlete then resorts to "more convenient" means, particularly if he believes he can improve his performance with a few pills. These practices, which are intended to achieve an artificial increase in capability and virtually amount to preparation for competition through medication, are generally known today under the term of doping.

1) History of Doping in Sports
2) History of Fight against Doping
3) Dose Doping Improve Athlete's Performance?
   * Side Effects of Doping
   * Placebo Test

Diminished Performance and a serious Threat to Health

International Olympic Committee List of Doping Classes and Methods – 1990

1. DOPING CLASSES
   A. Stimulants
   B. Narcotics
   C. Anabolic Steroids
   D. Beta-blockers
   E. Diuretics
   F. Peptide hormones and analogues

2. DOPING METHODS
   A. Blood doping
   B. Pharmacological, chemical and physical manipulation

3. CLASSES OF DRUGS SUBJECT TO CERTAIN RESTRICTIONS
   A. Alcohol
   B. Marijuana
   C. Local anaesthetics
   D. Corticosteroids

NOTE:

The doping definition of the IOC Medical Commission is based on the banning of pharmacological classes of agents.

The definition has the advantage that also new drugs, some of which may be especially designed for doping purposes, are banned.

The following list represents examples of the different doping classes to illustrate the doping definition. Unless otherwise indicated, all the substances belonging to the banned classes may not be used for

medical treatment, even if they are not listed as examples. If substances of the banned classes are detected in the laboratory the IOC Medical Commission will act. It should be noted that the presence of the drug in the urine constitutes an offense, irrespective of the route of administration.

Examples and Explanations

1. Doping Classes

A. Stimulants e.g.:

amfepramone, amfetaminil, amiphenazole, amphetamine, benzphetamine, caffeine*, cathine, chlorphentermine, clobenzorex, clorprenaline, cocaine, cropropamide (component of "micoren"), crothetamide (component of "micoren"), dimetamfetamine, ephedrine, etafedrine, ethamivan, etilamfetamine, fencamfamin, fenetylline, fenproporex, furfenorex, mefenorex, methamphetamine, methoxyphenamine, methylephedrine, methylphenidate, morazone, mikethamide, pemoline, pentetetrazol, phendimetrazine phenmetrazine, phentermine, phenylpropanolamine, pipradol, prolintane, propylhexedrine, pyrovalerone, strychnine and related compounds.

*For caffeine the definition of a positive depends upon the following: – if the concentration in urine exceeds 12 micrograms/ml

Stimulants comprise various types of drugs which increase alertness, reduce fatigue and may increase competitiveness and hostility. Their use can also produce loss of judgment, which may lead to accidents to others in some sports. Amphetamine and related compounds have the most notorious reputation in producing problems in sport. Some deaths of sportsmen have resulted even when normal doses have been used under conditions of maximum physical activity. There is no medical justification for the use of 'amphetamines' in sport.

One group of stimulants is the sympathomimetic amines of which ephedrine is an example. In high doses, this type of compound produces mental stimulation and increased blood flow. Adverse effects include elevated blood pressure and headache,increased and irregular heart beat, anxiety and tremor. In lower doses, they e.g. ephedrine, pseudoephedrine, phenylpropanolamine, norpseudoephedrine, are often present in cold and hay fever preparations which can be purchased in pharmacies and sometimes from other retail outlets without the need of a medical prescription.

THUS NO PRODUCT FOR USE IN COLDS, FLU OR HAY FEVER PURCHASED BY A COMPETITOR OR GIVEN TO HIM/HER SHOULD BE USED WITHOUT FIRST CHECKING WITH A DOCTOR OR PHARMACIST THAT THE PRODUCT DOES NOT CONTAIN A DRUG OF THE BANNED STIMULANTS CLASS.

–Beta2 agonists

The choice of medication in the treatment of asthma and respiratory ailments has posed many problems. Some years ago, ephedrine and related substances were administered quite frequently. However, these substaces are prohibited because they are classed in the category of "sympathomimetic amines" and therefore considered as stimulatnts.

The use of only the following beta2 agonists is permitted in the aerosol form: bitolterol, orciprenaline, rimiterol, salbutamol, terbutaline.

B. Narcotic analgesics e.g.:

alphaprodine, anileridine, buprenorphine, codeine, dextromoramide, dextropropoxyphen, diamorphine (heroin), dihydrocodeine, dipipanone, ethoheptazine, ethylmorphine, levorphanol, methadone, morphine, nalbuphine, pentazocine, pethidine, phenazocine, trimeperidine, and related compounds.

The drugs belonging to this class, which are represented by morphine and its chemical and pharmacological analogues, act fairly specifically as analgesics for the management of moderate to severe pain. This description however by no means implies that their clinical effects is limited to the relief of trivial disabilities. Most of these drugs have major side effects, including dose–related respiratory depression,

and carry a high risk of physical and psychological dependence. There exists evidence indicating that narcotic analgesics have been and are abused in sports, and therefore the IOC Medical Commission has issued and maintained a ban of their use during the Olympic Games. The ban is also justified by international restrictions affecting the movement of these compounds and is in line with the regulations and recommendations of the World Health Organisation regarding narcotics.

Furthermore, it is felt that the treatment of slight to moderate pain can be effective using drugs – other than the narcotics – which have analgesic, anti–inflammatory and antipyretic actions. Such alternatives, which have been successfully used for the treatment of sports injuries, include Anthranilic acid derivatives (such as Mefenamic acid, Floctafenine, Glafenine, etc.)

Phenylalkanoic acid derivatives (such as Diclofenac, Ibuprofen, Ketoprofen, Naprozen, etc.) and compounds such as Indomethacin and Sulindac. The Medical Commission also reminds athletes and team doctors that Aspirin and its newer derivatives (such as Diflunisal) are not banned but cautions aginst some pharmaceutical preparations where Aspirin is often associated to a banned drug such as Codeine. The same precautions hold for cough and cold preparations which often contain drugs of the banned classes.

NOTE : DEXTROMETHORPHAN AND PHOLCODINE ARE NOT BANNED AND MAY BE USED AS ANTI–TUSSIVES. DIPHENOXYLATE IS ALSO PERMITTED.

C. Anabolic steroids e.g.:

bolasterone, boldenone, clostebol, dehydrochlormethyltestosterone, fluoxymesterone, mesterolone, metandienone, metenolone, methyltestosterone, nandrolone, norethandrolone, oxandrolone, oxymesterone, oxymetholone, stanozolol, testosterone** and related compounds.

**Testosterone : the definition of a positive depends upon the following – the administration of testosterone or the use of any other manipulation having the result of increasing the ratio in urine on testosterone/epitestosterone to above 6.

This class of drugs includes chemicals which are related in structure and activity to the male hormone testosterone, which is also included in this banned class. They have been misused in sport, not only to attempt to increase muscle bulk, strength and power when used with increased food intake, but also in lower doses and normal food intake to attempt to improve competitiveness.

Their use in teenagers who have not fully developed can result in stunting growth by affecting growth at the ends of the long bones. Their use can produce psychological changes, liver damage and adversely affect the cardiovascular system. I male, their use can reduce testicular size and sperm production; in females, their use can produce masculinisation, acne, development of male pattern hair growth and suppression of ovarian function and menstruation.

D. Beta–blockers e.g.:

acebutolol, alprenolol, atenolol, labetalol, metaprolol, nadolol, oxprenolol, propranolol, sotalol, and related compounds.

The IOC Medical Commission has reviewed the therapeutic indications for the use of beta–blocking drugs and noted that there is now a wide range of effective alternative preparations available in order to control hypertension, cardiac, arrythmias, angina pectoris and migraine. Due to the continued misuse of beta–blockers in some sports where physical activity is of no or little importance, the IOC Medical Commission reserves the right to test those sports which it deems appropriate. These are unlikely to include endurance events which necessitate prolonged periods of high cardiac output and large stores of metabolic substrates in which beta–blockers would severely decrease performance capacity.

E. Diuretics e.g.:

acetazolamide, amiloride, bendroflumethiazide, benzthiazide, bumetanide, canrenone, chlormerodrin, chlortalidone, diclofenamide, ethacrynic acid, furosemide, hydrochlorothiazide, mersalyl, spironolactone, triamterene, and related compounds.

Diuretics have important therapeutic indications for the elimination of fluids from the tissues in

certain pathological conditions. However, strict medical control is required.

Diuretics are sometimes misused by competitors for two main reasons, namely: to reduce weight quickly in sports where weight categories are involved and to reduce the concentration of drugs in urine by producing a more rapid excretion of urine to attempt to minimise detection of drug misuse. Rapid reduction of weight in sport cannot be justified medically. Health risks are involved in such misuse because of serious side-effects which might occur.

Furthermore, deliberate attempts to reduce weight artificially in order to compete in lower weight classes or to dilute urine constitute clear manipulations which are unacceptable on ethical grounds. Therefore, the IOC Medical Commission has decided to include diuretics on its list of banned classes of drugs.

N.B. For sports involving weight classes, the IOC Medical Commission reserves the right to obtain urine samples from the competitor at the time of the weigh-in.

F. Peptide hormones and analogues

Chorionic Gonadotrophin (HCG - human chorionic gonadotrophin): it is well known that the administration to males of Human Chorionic Gonadotrophin (HCG) and other compounds with related activity leads to an increased rate of production of endogenous androgenic steroids and is considered equivalent to the exogenous administration of testosterone.

Corticotrophin (ACTH): Corticotrophin has been misused to increase the blood levels of endogenous corticosteroids notably to obtain the euphoric effect os corticosteroids. The application of Corticotrophin is considered to be equivalent to the oral, intra-muscular or intravenous application of corticosteroids. (see section 3.D)

Growth hormone (HGH, somatotrophin): the misuse of Growth Hormone in sport is deemed to be unethical and dangerous because of various adverse effects, for example, allergic reactions, diabetogenic effects, and acromegaly when applied in high doses.

All the respective releasing factors of the above-mentioned substances are also banned.

Erythropoietin (EPO): is the glucoprotein hormone produced in human kidney which regulates, apparently by a feed-back mechanism, the rate of synthesis of erythrocite.

2. Methods

A. Blood doping

Blood transfusion is the intravenous administration of red blood cells or related blood products that contain red blood cells. Such products can be obtained from blood drawn from the same (autologous) or from a different (nonautologous) individual. The most common indications for fed blood transfusion in conventional medical practice are acute blood loss and severe anaemia.

Blood doping is the administration of blood or related red blood products to an athlete other than for legitimate medical treatment. This procedure may be preceded by withdrawal of blood from the athlete who continues to train in this blood depleted state.

These procedures contravene the ethics of medicine and of sport. There are also risks involved in the transfusion of blood and related blood products. These include the development of allergic reactions (rash, fever etc.) and acute haemolytic reaction with kidney damage if incorrectly typed blood is used, as well as delayed transfusion reaction resulting in fever and jaundice, transmission of infectious diseases (viral hepatitis and AIDS), overload of the circulation and metabolic shock.

Therefore the practice of blood doping in sport is banned by the IOC Medical Commission.

The IOC Medical Commission banns Erythropoietin as method of doping (see section 1. Doping Classes, F- Peptide hormones and analogues).

B. Pharmacological, chemical and physical manipulation

The IOC Medical Commission bans the use of substances and of methods which alter the integrity and validity of urine samples used in doping controls. Examples of banned methods are catheterisation, urine substitution and/or tampering, inhibition of renal excretion, e.g. by probenecid and related compounds.

3. Classes of Drugs Subject to Certain Restrictions

A. Alcohol

Alcohol is not prohibited. However breath or blood alcohol levels may be determined at the request of an International Federation.

B. Marijuana

Marijuana is not prohibited. However, tests may be carried out at the request of an International Federation.

C. Local anaesthetics

Injectable local anaesthetics are permitted under the following conditions :

a) that procaine, xylocaine, carbocaine, etc. are used but not cocaine;

b) only local or intra-articular injections may be administered;

c) only when medically justified (i.e. the details including diagnosis; dose and route of administration must be submitted immediately in writing to the IOC Medical Commission)

D. Corticosteroids

The naturally occurring and synthetic corticosteroids are mainly used as anti-inflammatory drugs which also relative pain. They influence circulating concentrations of natural corticosteroids in the body. They produce euphoria and side-effects such that their medical use, except when used topically, require medical control.

Since 1975, the IOC Medical Commission has attempted to restrict their use during the Olympic Games by requiring a declaration by the team doctors, because it was known that corticosteroids were being used non-therapeutically by the oral, intramuscular and even the intravenous route in some sports. However, the problem was not solved by these restrictions and therefore stronger measures designed not to interfere with the appropriate medical use of these compounds became necessary.

The use of corticosteroids is banned except for topical use (aural, opthalmological and dermatological), inhalational therapy (asthma, allergic rhinitis) and local or intra-articular injections.

ANY TEAM DOCTOR WISHING TO ADMINISTER CORTICOSTEROIDS INTRA-ARTICUARLY OR LOCALLY TO A COMPETITOR MUST GIVE WRITTEN NOTIFICATION TO THE IOC MEDICAL COMMISSION.