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Do young athletes have access to support from sport scientists – and if so, what difference does it make to their performance?

Sports Science in Table Tennis

The general aim of the research in table tennis and exercise medicine is to present an evidence-based view of the **beneficial and adverse effects of physical activity and exercise training on table tennis player and his health**. Although the use of scientific research in sport has a long tradition, currently the practice of supporting table tennis with scientific findings is largely neglected.

Science in Table Tennis should bring together experts from around the Europe and world with the aim of furthering collaboration between players, coaches and scientists working in the field of training and competition in table tennis. Each part of training and the game gets theory (sport science) with practice (training and performance) in order to demonstrate the impact science can have on performance at the elite level. Examples could be given from other racket sports (tennis, badminton, and squash) and in the context of specific countries within Europe. This team of scientists will be of great value to any one studying sport science degree with the aim of entering into coaching or training. It will also be a key resource for those already involved in the implementation of coaching strategies at the elite level and also for players themselves.

Success in table tennis is much more likely if players follow a sound training program based on scientific training principles, to prepare themselves physically and mentally for the rigorous demands of national and international competitions. Coaches are therefore obliged to encourage players to base their training on scientific training principles in order to enhance their performance, as well as to remain injury free.

The idea to include science into the training of table tennis it's a great initiative from ETTU for European table tennis players and will help to move them forward to Olympics 2012 and beyond. It's an exciting time for table tennis sports science and I hope this will be a model also for other continents. This could be the start of a new era of sports science in table tennis in Europe. We don't want people sitting in committees day and night; we want them out

in sports halls, at the training sessions and laboratories, influencing players and making a difference to performance. Although European players are very successful, the player's are much more art-based than science-based. We want a little bit more science to influence Olympics in 2012 and 2016.

From the viewpoint of sport psychology, sports medicine, nutrition, performance analysis, physiology, talent identification, strength & conditioning and biomechanics, we would like to carry out the scientific support for young and elite players in table tennis. The support of sport psychology will collect the data about behaviours in table tennis play by VTR, Sportsman Motivation Inventory (SMI) for searching the psychological conditioning state of peaking, and heart rate in the game. In the support of biomechanics, EMG, load and nutrition distribution methods were adapted for studying the muscular activity and load distribution ratio in the game. Based on these data, the staffs of scientific support and the coach of table tennis will have a meeting to examine the effects of the scientific supporting project.

BRANCHES FOR SCIENTIFIC RESEARCHES IN TABLE TENNIS

SPORTS MEDICINE

Sports and Exercise Medicine involves the medical care of injury and illness in table tennis. Solutions require accurate diagnoses, careful clinical examination, experience and knowledge of sport specific movement patterns (especially different strokes in table tennis). Sports Physicians have to be trained in musculoskeletal ultrasound and various injection techniques – particularly regarding loads which come out in table tennis game (which is the most important demand!). Sports medicine is particularly important to performance athletes, both from an injury and illness perspective. Where ever possible it should be available at short notice as time is crucial for players in terms of getting back to the table tennis as quickly as possible as usually injuries get worse if they are left.



PERFORMANCE ANALYSIS

Performance Analysis is the provision of objective feedback to performers trying to get a positive change in performance. Essentially it is about telling the table tennis player what actually happened as opposed to what they perceived to be happening. Some researches shows that on average, players and coaches can only recall 30% of performance correctly - performance analysis helps with the remaining 70%.

In table tennis the analysis can either take place immediately following the performance i.e. at the table or can take place in the laboratory in a more controlled environment – which is not common in table tennis. One of the benefits of providing immediate feedback is providing the player with the opportunity to make adjustments to improve performance straight away. But the coach is valuable to the analysis as spotting the problem is easy, but the trick is how to fix it and that's where the coach comes in. Within a training environment immediate visual feedback software could be used which offer images pre and post-feedback for comparison. In a competitive environment, the player would look at the profile and stats of their opponent for the next game or day; they would then discuss the data and that would contribute, along with past experiences, to the player's game plan.



PHYSIOLOGY

Exercise Physiology is the study of how exercise alters the function and structure of the body. A sports physiologist examines the acute responses and chronic adaptations to player's performance in a variety of training and competition situations. The physiologist possesses a wide-ranging understanding of the body, enabling them to advise athletes and coaches of how training and preparation influence competition performance.



Testing can take place in the lab, which ensures a controlled environment to compare exercise test results. However, it is not always possible to simulate sporting activity in a lab (especially in table tennis!) and with advances in technology physiologists use field-based testing as much as possible. This work is vital as it can evaluate training as it happens; allowing the player and coach to objectively monitor what impact a particular session has had on the body. Physiology can improve an athlete's performance by giving important objective information which can help coaches to adapt training programmes to maximise their desired outcome. This will depend on many factors including the conditions, diet, gender, age and health.



TALENT IDENTIFICATION

Talent Identification is both an art and science involving a complex blend of scientific knowledge and assessment, alongside coaching art. It is designed to proactively seek out those that possess the raw material for World

Class success, and respond positively to an intense training and competition environment in table tennis. The scientific approach of identifying talent involves a series of rigorous assessments and filters to detect individuals that have 'higher probability' for podium success. The system has to be smart enough to select individuals based on their future abilities and standards required to deliver medals in five years time. Not just current performance abilities being produced here and now.



BIOMECHANICS

Biomechanics is the scientific discipline which studies mechanical parameters of human motion. In sport and especially in table tennis, it can help to improve performance by means of developing more effective motion technique as well as to avoid injury.



Biomechanics can use a wide range of tools: instrumented measurements using force platforms or telemetry systems, 3D video analysis, speed guns and high speed cameras, electro-typography and pressure distribution systems. Testing can take place both within the lab as well



as the field which could include analysing the performance of a player in training and competition analysis. This can help diagnose any problems which might be limiting sporting potential and with close consultation with the players coach, training patterns may be altered to rectify the problem. The impact this can have on a players' performance is significant.

STRENGTH AND CONDITIONING

Strength and Conditioning is the physical and physiological development of athletes for elite sport performance. The role of the S&C coach is to bridge the gap between the theory of training and applied training, helping players to become faster, stronger and more flexible and



to build their muscular endurance so they perform better and remain injury free.

Strength and Conditioning is about more than lifting weights - it encompasses the entire development of the player and what is needed to improve physical

performance. This includes plyometrics, speed and agility, endurance and core stability with strength training being just one piece of the jigsaw.

Strength and conditioning coaches' works alongside a table tennis coach to assist them in designing specific programmes that will address the particular need of the player. There are many ways a well constructed programme can add to the rehabilitation, speed, agility, endurance and strength of the players - a periodised programme that targets both strengths and weaknesses will produce the best possible performance.

PSYCHOLOGY

The mind has a key role to play especially in table tennis. What we think and how we feel, will impact on any sporting performance and not only on game outcome. Sport psychology is focussing on enhancing sport performance by helping players and coaches develop mental skills to become better at what they are already very good at.



A positive mindset during training keeps player focused on making the small improvements to make him better. A positive mindset during competition may make that 1% difference between achieving player goals. Sport psychologists help player identify that winning mindset to develop, enhance and maintain optimal performance.

PHYSIOTHERAPY

Physiotherapy aids injury prevention and assists in the rehabilitation of players back to normal performance levels. In terms of injury prevention, a physiotherapist must work closely with a player and coach to make sure they are in a better position to avoid recurring injuries - helping them to identify the tell-tale signs and to introduce exercises to address the problem earlier.



A physiotherapist does not work in isolation but relies on the expertise of the coach, the strength and conditioning coach and the sports doctor. Through teamwork, an agreement is reached in the short, medium and ultimate long term goal and what support package is required to attain those goals. Athlete treatment can take place at the

training and/or competition venue.

NUTRITION

Nutrition can play a huge role in supporting the training and competition demands of any elite player. Food alone will not make you to beat Ma Lin or Wang Liqin or Timo Boll, but the right diet is absolutely central in supporting training to make those achievements possible. Good food choices help ensure fuel needs and promote adaptations to training in order to continue and intensify training and to ensure good health to prevent illness and injury.



Other features we have to take in consideration:

- Analysis Equipment - Biomechanics
- Anthropometry Equipment
- Blood Analysis Equipment and Consumables
- Computing Equipment - Biomechanics
- Electronics - Biomechanics
- Ergometers
- Field Testing Equipment - Physiology
- Maximal Oxygen Uptake Equipment and Consumables
- Software Applications
- Strength and Conditioning Training Equipment
- Strength/Force Testing Equipment
- Video Equipment - Biomechanics

The ETTU Science in Table Tennis Team (ESTTT) have to complete recruiting its team of sport science and sport medicine experts to drive its support services forward over the coming cycle. Director of Sport Science and Director of Medical Services, will be working closely with the 'Heads of Service' to establish the delivery and development plans ensuring ESTTT continues to impact upon athletes' performance on the world stage. It will be a great marker that we will now have the team in place to help us drive the delivery and development of all of the sport science and medical services the ESTTT offers to table tennis over the coming years.

We have several major events on the horizon and army of Asian players which require the ESTTT to be at the forefront of service provision in elite sport. Having the right expertise to keep ahead of the competition on the world stage and ensure athletes are as well prepared as they can be is vital for ongoing success.

I would be delighted that the ESTTT would establish a strong team early in this Olympiad to continue the delivery of world class scientific and medical services to players. The ESTTT is well placed to have a positive impact on performance in this crucial time period up to 2012 and 2016, and I look forward to working in partnership with them to continue to develop the EU high performance system.

The team should include scientists with next positions: Head of Performance Nutrition, Head of Performance Analysis & Biomechanics, Head of Physiology, Head of Strength & Conditioning, Head of Sports Psychology, Head of Sport Science & Medicine (Paralympic Sport). The Sport Science team, under Director of Sport Science, will work with the universities and medical teams all over the world to develop and deliver ESTTT support services over the coming years.

Some researches which have been provided since now has shown us that that at least 10 types of training (motor abilities) have to be monitored: agility & skill (i.e. especially in our sport), speed, endurance, strength, power, core stability, recovery & regeneration (including sleep), nutrition, flexibility & suppleness (and stretching to some degree) and mind control and sport psych.

The 7 scientific principles of the training

According to Lee table tennis player have to follow the 7 basic scientific principles of training. All areas of training are required by all players, in varying quantities and qualities, according to event and training period.

1. STRESS – body responds to stress that is regular and reasonable.
2. OVERLOAD - Stress must be adequate to create a need for the body to adapt.
3. SPECIFICITY - You get what you train for.
4. REGULARITY - More regular the training, the more rapid the improvement.
5. PROGRESSION - Occurs gradually and in jumps.
6. DIMINISHING RETURNS - The closer you get to your potential, the smarter you must train for small gains.
7. RECOVERY - Improvements come when we recover. Must get adequate rest, nutrition and hydration.

Everything (i.e. the system as a whole) breaks down when we fail in any of these. These are only few thoughts that I expressed on this paper. Further discussion is necessary to find out the right way for getting alive idea of ESTTT. I hope that ETTU will find power and resources to bring up idea of ESTTT.