

Pg.	Title / Author
2	Editorial
3	The "Sigma Test": A new methodology for evaluating a tennis player Salvatore Buzzelli (ITA)
6	Exercises to improve the position of the head in tennis strokes Manuel Fernández López (ESP)
9	Preoccupation with results can be damaging for young coaches Callum Gowling (GBR)
12	Tennis masters. Nitto vs Next Generation ATP Finals Alejandro Sánchez-Pay, José Julián Navarro-Cuenca & Bernardino J. Sánchez-Alcaraz (ESP)
15	Serve routine preparation: Benefits of a combination of imagery, ball bounce and breathing on performance Laurent Dominique & Nicolas Robin (FRA)
17	Pearls of Wisdom from Rod Laver, AC, MBE Janet A. Young (AUS)
19	Designing an upper body resistance training program using closed kinetic chain exercises Britt Chandler (USA)
21	Bibliometrics of ITF Coaching & Sport Science Review Duane Knudson (USA)
24	PETF performance indicator: An analysis of current tactical trends in women's tennis Enrico Serfotis (BRA)
27	Proposal of a specific test in tennis: Test of shot speed and precision Manuel Alfonso-Asencio, Marta Hellín-Martínez & Bernardino J. Sánchez-Alcaraz (ESP)
30	Recommended books Editors
32	Recommended web links Editors
33	General guidelines for submitting articles to ITF Coaching & Sport Science Review Editors

The Official Coaching and Sport Science Publication of the International Tennis Federation

EDITORIAL

Welcome to issue 82 of the ITF Coaching and Sport Science Review. Since our last issue published in August, the COVID-19 pandemic is still affecting tennis activities worldwide. Again, during these troubling times, our foremost thoughts are with everyone who has been directly affected by the pandemic, and we send our condolences to those who have lost loved ones and those who are currently suffering.

This issue includes contributions from all over the world and cover a wide range of topics such as women's tennis, physical training and evaluation, biomechanics training and testing, psychology, notational analysis, history, bibliometrics, etc.

The ITF World Tennis Number is the most relevant ITF digital transformation project. With the ITF World Tennis Number, the vision held by the ITF was to create a unifying digital platform to reach and engage the millions of amateur players around the world via the national associations. A digital development tool offered free of charge will unify the sport by establishing a common language, a single global benchmark to grow tennis in each territory and continent around the world. The ITF World Tennis Number is set to inspire millions of players worldwide to play more often and have a more enjoyable tennis experience by providing level-based play and allow players from all over the world to compare themselves without the need to travel extensively. Our ongoing work to grow the sport with all of our member nations, large and small, developed and developing, has allowed us to engage effectively with our stakeholders on the ITF World Tennis Number. From 2021, the ITF member nations will roll out the ITF World Tennis Number week after week to establish the largest digital tennis community ever. We will ensure that the launch time suits the nation and matches their ability to support, maintain and promote the ITF World Tennis Number product. Please [click here](#) to access to more information.

We are also pleased that under challenging circumstances during 2020 the ITF Academy, our online educational digital platform has provided valuable free of charge resources. New interactive online courses have recently been added with 115 free courses currently available in English and a further 112 in Spanish, 111 in French and 77 in Portuguese. The Russian section has also been launched by offering 59 free courses. The player education section will be available in early 2021. With more than 110,000 users and over 30,000 registered users, the top countries in registered users include India, Colombia, Argentina, Brazil and Spain.

The ITF Academy is an integral element of the "blended learning" methodology already implemented in all ITF certification courses. All the ITF Coaching activities are done through the ITF Academy. Therefore, all those interested in taking part in the activities must be registered. The ITF Academy is directed towards coaches, players, parents and all interested in increasing their tennis knowledge. Please [click here](#) to register for free now.



In addition to the courses and resources available on ITF Academy, in October the first free webinar was held for Parents using the ITF Academy. More than 600 users registered from 100 countries.

Three 2020 ITF Regional Coaches Conferences by BNP Paribas were organised online in English, Spanish and French as a sign of adaptation to the very different circumstances we all continue to face due to the impact of the pandemic. Each conference took three days over two hours sessions. It was great that, despite the disruption to nearly all tennis activity in 2020, it was still possible for these events to go ahead virtually. Although we could not all meet together, more than 2250 coaches from over 150 nations, with a record of 26% female participation, still had the opportunity to listen to some of the more than 30 leading experts, as well as current and former international players, discussing many relevant and important subjects. The presentations are already available at the ITF Academy.

The ITF would like to thank you the coaches, who play such a vital role in the continued development of tennis, and the nurturing of talent, around the world. We know that this will have been an extremely challenging year for you all. Through our strong networks of regional and national associations we will continue to work together to learn, develop and share knowledge for the good of the sport.

We would also like to encourage new submissions to the ITFCSSR, and full guidelines for acceptance and publication of articles can be found in the most recent issue page on the ITF Academy. Finally, we would like to thank all the authors for their contributions, as well as all of those who sent in proposals. We hope that you enjoy reading the 82nd edition of the ITF Coaching and Sport Science Review.

Luca Santilli
Executive Director Tennis Development

Miguel Crespo
Head Participation & Education Tennis Development

The "Sigma Test": A new methodology for evaluating a tennis player

Salvatore Buzzelli (ITA)

ITF Coaching and Sport Science Review 2020; 82 (28): 3-5

ABSTRACT

This article aims to illustrate an innovative and absolutely functional method of assessing the fitness of a tennis player, based on the registration of an incremental metabolic effort, in an applied way.

Key words: Sigma Test, Tennis, Assessment Test, Physical form, Attention Energy Cost.

Corresponding author: salvatorebuzzelli1@gmail.com

Article received: 15 May 2020

Article accepted: 18 Sep 2020

INTRODUCTION

In the functional evaluation of the tennis player, especially when one wants to investigate his Maximum Power Aerobics (VO₂max), it is usual customary to utilize evaluation tests already widely known and equipped with a considerable amount of scientific and methodological documentation.

The most used tests in this field range from the Cooper test (12 minutes of continuous and linear running) (Fox, 1973); to the Leger test (increasing levels of running rhythms every minute, in linear running and changes of direction every 20m, until exhaustion) (Léger, 1988); to the YoYo Test (linear runs of 20m with change of direction, at increasing rates guided by an audio track, until exhaustion) (Krustrup, 2003).

These tests, although predictive of the Maximum Aerobic Performance Capacity, have a structural and methodological limit of great importance in a sport such as tennis, in fact in their execution they run in non-specific mode, always over distances not suitable for tennis movements and above all not account is taken of the attentional aspect, which plays a decisive role in competitive performance (Tamorri, 2000; Buzzelli, 2007; Smith, 2016). In fact, unlike other athletes of other situation sports, the tennis player moves over short distances (80% of the movements are within a radius of 4-5m) in the direction of the incoming ball and will have to raise attention levels if he wishes respect the right times to hit the best and in the best position.

Starting from these last fundamental considerations, in 2007, a specific test (Sigma Test) (Buzzelli, 2007), was developed that would respond in a more functional way to what you really needed to know, that is what is the maximum capacity of organic resistance in an attentive form, on which develop very specific training plans.

DESCRIPTION

The "Sigma Test" is a test designed and developed to investigate the specific resistance of a tennis player. The development of the test was inspired by multistage fitness test, such as the Legér test or the YoYo test, but unlike these tests, the participants are running shuttles on 5,5 meters, repeated until the physical and mental abilities of reaction and specific stroke, are exhausted.

It is performed in one half of the tennis court and both metabolic and attentional aspects are involved in its realization. It is guided by an electronic track based on visual and acoustic signals. It is possible to carry out 2 types of sigma test; one with only acoustic trace (default, non-attentional), the other with acoustic and visual trace (original, attentive). The difference in terms of the results of the two tests, will provide us with the "Energy Cost of Attention" (Buzzelli, 2014). However, we will not deal with this possibility in this article which we may defer to another occasion.



MATERIALS AND METHODS

To carry out this test, starting from 2007 (Buzzelli, 2007), a special tool called initially "SensoTouch" and then definitively "SensoBuzz", was used but currently it is possible to use a smartphone application, also called "SensoBuzz" (Buzzelli, 2019), which emits visual and acoustic signals in a random mode with a pre-established time scan.

The exercise is performed on one half of the tennis court organized as shown in figure 1. The correct execution of the test involves shuttle movements, in which the chaining of the run-stop-restart action towards and from a target corresponding to the signal emitted must be correctly managed, starting from a point called "base" and avoiding remains still on it, waiting for the next signal.

The introductory minute is just to allow the student to correctly adapt the speed of movement to the rhythm of the signals. Each minute the "SensoBuzz" decreases the emission rhythm by 0.2 seconds, causing the movement speed to be increased. Each signal corresponds to a complete round trip of 11 meters, that is 5.50 meters to go and as many to return to the "base". The instrument counts the number of "shuttles" and the total working time.

The errors of moving to a target other than the one indicated, are allowed and will be recorded by the examiner during the execution of the test. It is also possible that the student sees the error and corrects himself by heading in the right direction. Of course, errors cause uncertainty and hesitancy in moving, requiring the student to take small shots to recover space and remain in the rhythm of the test.

At the end of the test, a large number of errors will have resulted in a supplementary effort determined by the sum of the

accelerations, with the consequence of a reduction in the overall performance capacity. The test ends when the athlete is still in the vicinity of a finish line while a new signal is emitted, therefore in considerable delay that he can no longer fill with any running accelerations.

The following are recorded: the number of shuttle runs performed correctly (corresponding to the number shown on the instrument display) as well as the chronological calculation of any errors made during the whole test.

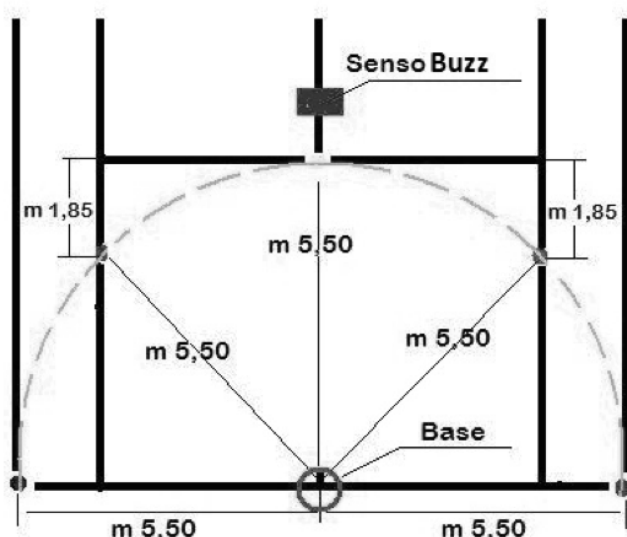


Figure 1. Test set up on-court.

The test, which is carried out by carrying out specific stroke movements, also involves the ability to pay attention and maintain concentration. The examinee, following the rhythm imposed by "SensoBuzz", must move with shuttle runs (round trip) from a central point called "base" to a goal called "target" and return. The return to the "base" must correspond to the reception of a new signal issued by "SensoBuzz".

The targets are five, and are placed in a semicircle at a distance of 5.50 meters radially from the "base" and placed randomly in the fixed points of the portion of the tennis court used, as shown in figure 1. The targets are associated with five different signals, which by convention have been set in three visual (red, blue, yellow) and two audible: one acute and one double.

The test is incremental starting from a rhythm of signal emission one every 5 seconds; this rhythm allows the examinee to adapt to the test, being able to move quite easily and enter the test rhythm, during the first minute. At each minute, the emission time between one signal and the other (split time) decreases by 0.2 seconds, with consequent adjustment of the movement speed by the examining member.

Test Protocol

The examining member places himself in a standing position on the "base" ready to activate at the first signal. When the first signal is emitted, he will run towards the corresponding target, touch the space immediately facing the "goal" with his foot and with a decisive change of direction without turning his back on the midfield network, he returns to the "base", preparing to perform the shift relative to the next signal.

The movements must follow the specific running technique, as if you were playing tennis, according to the rhythm defined by the instrument. To have a reliable assessment of the organic

resistance, the test must be carried out for at least 3 minutes. The test ends when the examining member's inability to sustain the rhythm imposed by the instrument will be manifested, precisely when the student is on a target and the instrument emits another signal.

When this event occurs, the "SensoBuzz" application will be stopped by the operator and the total duration of the test, the number of signals performed, the meters travelled (according to the formula Meters = Cycles x 11) will automatically be highlighted in a screen. , where 11 represents the base-target-base route expressed in meters), the specific speed reached in the test in Km/h and m/s and the theoretical value of the Maximum Oxygen Consumption according to the formula:

$$VO2max = 33,3 + (3,3 * Speed) - (3,25 * Age) + ((0,2 * Speed) * Age),$$

(Lèger, 1988)

With these data available, the coach can then suggest personalized training according to the motor and metabolic capacity he wants to develop in the athlete. The data shown in Table 1, show the values corresponding to the result expressed in cycles, obtained in the test.

Duration of the Test	Test step	Interval between signals (sec.)	Total n° signals	Total meters paths	Average speed (Km / h)	VO2 max (ml/Kg/min) (theoretical) (average values for ages between 17-19 years)
0'00"	---	5	---	---	---	---
0'30"	0,5	"	6	66	7,92	---
1'00"	1	4,8	12	132		29,86
1'30"	1,5	"	18	200	8,25	30,43
2'00"	2	4,6	24	269		31,68
2'30"	2,5	"	30	341	8,58	32,23
3'00"	3	4,4	37	412		33,51
3'30"	3,5	"	44	487	8,91	35,35
4'00"	4	4,2	51	561		37,17
4'30"	4,5	"	58	638	9,24	38,22
5'00"	5	4,0	65	715		40,83
5'30"	5,5	"	72	797	9,9	41,12
6'00"	6	3,8	80	880		42,66
6'30"	6,5	"	88	978	10,56	44,71
7'00"	7	3,6	96	1056		46,32
7'30"	7,5	"	104	1147	10,89	47,83
8'00"	8	3,4	112	1237		49,97
8'30"	8,5	"	121	1333	11,55	52,54
9'00"	9	3,2	130	1430		55,46
9'30"	9,5	"	139	1532	12,21	57,85
10'00"	10	3,0	148	1633		60,95
10'30"	10,5	"	158	1743	13,20	63,07
11'00"	11	2,8	168	1853		66,43
11'30"	11,5	"	181	1972	14,19	69,34
12'00"	12	2,6	190	2090		73,75
12'30"	12,5	"	202	2216	15,18	76,03
13'00"	13	2,4	213	2343		78,45

Table 1. Sigma Test Values.

The following are the average values of the cycles performed and Dev.St. divided by age, relating to the two genders (male and female).

Age	11-12	13-14	15-16	17-18	19 and more
Male	56,9	76,3	94,1	116,7	124,6
Dev.St.	21,8	14,2	17,3	10,6	11,3
Female	59,2	70,2	83,4	92,3	97,2
Dev.St.	10,4	24,6	16,3	19,4	14,1

Table 2. "Sigma Test" and age: average reference values of cycles.



CONCLUSIONS

The "Sigma test" is a simple test even for very young athletes (at least 10 years of age). It is performed on a portion of the tennis court and consequently does not need special measurements, provided that the court is approved. Alternatively, it can be performed in a space delimited by a semicircle with a radius of 5.5 meters from the centre, on which 5 targets are arranged randomly which must be positioned as the cardinal points North, East, West, North-East and North-West.

Data processing takes place automatically and shown to the user, in a final screen after stopping the test, from the "SensoBuzz" application. A fit tennis player performs a large number of shuttles, recording none or very few sequence errors.

REFERENCES

- Buzzelli, S (2007). SensoTouch Buzzelli System, Pubblicazioni, available at: www.salvatorebuzzelli.it.
- Buzzelli, S. (2013). SensoBuzz, Pubblicazioni, C.E.Youcanprint.
- Buzzelli, S. (2014). Costo energetico dell'attenzione, Ricerca Scientifica, available at www.salvatorebuzzelli.it.
- Fox, E. L. (1973). A simple accurate technique for predicting maximal aerobic power. *J Appl Physiol*.5: 914-6.
- Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., ... & Bangsbo, J. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Medicine & Science in Sports & Exercise*, 35(4), 697-705.
- Leger, L. A., Mercier, D., Gadoury, C., & Lambert, J. (1988). The multistage 20 metre shuttle run test for aerobic fitness. *Journal of Sports Sciences*, 6(2), 93-101.
- Smith, M. R., Zeuwts, L., Lenoir, M., Hens, N., De Jong, L. M., & Coutts, A. J. (2016). Mental fatigue impairs soccer-specific decision-making skill. *Journal of Sports Sciences*, 34(14), 1297-1304.
- Tamorri, S. (2000). *Neuroscienze e sport: psicologia dello sport, processi mentali dell'atleta*, Utet.

RECOMMENDED ITF TENNIS ACADEMY CONTENT (CLICK BELOW)



Exercises to improve the position of the head in tennis strokes

Manuel Fernández López (ESP)

ITF Coaching and Sport Science Review 2020; 82 (28): 6-8

ABSTRACT

Tennis is an opposition sport in which we hit the ball with the racket whilst in movement, attempting to place it as far away from our opponent as possible but within the court. It is also a high-speed interception sport, and the speed increases with the level of the players. This article presents different specific on-court exercises to help players to improve their capacity to adapt to changing tennis dynamics.

Key words: vision, balance, fixing, impact.

Article received: 10 May 2020

Corresponding author: tennisplus.manu@gmail.com

Article accepted: 29 Jul 2020

INTRODUCTION

A review of scientific studies on this subject leads us to conclude that it is probable that the most skilled and successful players, and almost certainly professional players, try to anticipate the zone where they think the ball will bounce, i.e. they try to anticipate the flight of the ball, so as to be in a better position to hit it. This can also help players to anticipate the variations the ball may undergo during the bounce (Lafont, 2008).

As players start fixing their eyes and their head ("gaze"), they start searching for motor solutions to several challenges at the same time, one is stability at impact, and another is maintaining high concentration at the time of impact (including just before and after), so as not to lose concentration on other aspects such as the target or the position of the opponent. This loss of concentration can be related to the anxiety or stress generated by the importance of a point (subjective to the player) (Luis del Campo, Reina, Sabido, & Moreno, 2015).

The work of the coach with regard to these questions consists of practical interventions to help the player manage the game dynamics. In short, two kinds of work are suggested: dynamic stability at impact and concentration at impact.

WORKING ON STABILITY AT IMPACT

The more power a player intends to hit the ball to the other side of the net with, the greater the stability should be; therefore, the further away a player is from their PHV and their highest level of play, the greater the amount of training on stability and head-eye fixations players should undertake.

Hitting exercises with rubber bands, throwing with the medicine ball, and with free weight exercises (e.g. dumbbells, etc.) which are used to train strength, can be used to train stability. Any hitting exercise, with or without a ball, including strength exercises above, on unstable surfaces (e.g. a bosu balance trainer, kneeling on a "fitball" and hitting on a balance disk) will be appropriate for attaining this goal.

Exercises that simulate the real game will help obtain the most appropriate conditions to observe, evaluate, and train hitting stability at impact. This is due to the fact that since each decision on how much power to hit the ball and body position will be unique and differ from shot to shot. (Shafizadeh, Bonner, Fraser & Barnes, 2019).

This variability in the game makes it necessary to consider the next shot, not as something to practice separately, but to integrate into the aforementioned exercises; still, some isolated strength training routines may be useful in reducing or eliminating uncertainty.

WORKING ON CONCENTRATION AT IMPACT

Concentration is key in tennis, and during the different phases of the stroke, players must focus their attention on: the right direction (as previously discussed); the moment of impact (and even before the ball arrives); and on the area where the ball is expected to bounce or on the impact zone. All this helps to manage pressure, anxiety or stress, and at the same time, to be more accurate when trying to hit the target or aiming for a certain direction.

Quiet Eye (QE) helps to gather information on the bounce of the ball, subconsciously taking place as a high speed reaction and also relying on the information gathered on the position of the opponent and/or the movements detected, and this will help to anticipate the tactics that should be used.

We must bear in mind that training strokes with a target or tactic in mind must be done as soon as possible given that technique without a target makes no sense, and when the player gets used to having a target, accuracy, direction and attention come into play. In order to more-than-adequately attend to the impact zone, it is necessary to have a good orientation of the player's situation on court since this will affect the different characteristics such as height, spin or speed (Keller & Ripoll, 2006).

The attention on the target or on the opponent means that there will be a reduced attention on the impact zone, and therefore that stroke will not be that accurate. This will not be a case of a high or low percentage, it will be on an internal scale that the player must learn to detect, evaluate and balance. Whilst QE helps to gather important information about learning, keeping it focused on the impact zone can build a continuous learning relationship in each stroke, allowing for consideration of the many factors that the body unconsciously perceives for its own benefit, learning from the experiences lived, and using them for future situations (Giblin, Whiteside & Reid, 2017).

EXERCISES

Table 1 shows some proposed exercises. It discusses the training differences in different stages, also providing a progression for players.

It must be kept in mind that the progression presented could be a strategy in itself, appropriate for some types of players, but not all, since individualisation and adaptation of training to the player characteristics is key (gender differences are not considered as we understand that speed and accuracy depend on the same factors for all, regardless of the tactics used in the game) (Elliott, Reid & Crespo, 2009).

Table 1. Proposed exercises.

Stage	Exercise	Observations
General (in all)	Throwing the medicine ball or other lighter or heavier objects (image 1).	These exercises can be used at any stage, and the equipment and/or weight is adapted to the characteristics, level and biologic age of the players.
	Hitting with dumbbells, rubber bands or toning bands with different weights (image 2).	
	Hitting with targets, real game like situations and real matches (image 3).	
	Hitting with or without a ball, or weight / (dumbbells, rubber bands or tonings) on unstable surfaces or objects (bosu balance trainer, fitball and balance disk (image 2 & 3)).	
Beginner and intermediate (competition prior to juniors).	On court orientation - hitting and throwing from different points and playing games using zones (back, middle (image 4) and net), etc.	When doing the exercises, it is necessary to provide the instruction to maintain head position, and to avoid looking at the target or the target zone (this must be explained, for it is natural to hit looking at the targets).
	Hitting and throwing with big targets (cones (image 5), goal targets, air rings (hula hoops), rope over the net height, etc.).	
Junior competition	Concentration during the stroke under pressure (with distracting noises, decisive points with penalties, etc.)	Match and training video recordings for analytical use later on can help evaluate levels of concentration at impact.
	Hitting and rallying whilst aiming at small targets (cones, lines and balls) (image 6).	
Professional (top performance)	Strength training at high speeds looking to push the limit of the movement whilst maintaining balance and optimum movement of the joints (image 1).	Video recordings may be very useful for later observation. At this stage, it is important to place emphasis on adequate nutrient replenishment of the muscles and a good work-rest balance (and also to have appropriate routines), due to high workloads, both in volume and in intensity.
	Repeated strokes for transference of strength to the court, and accuracy in relation to the movements (image 7).	
	Situations of maximum pressure and stress, as close to competition as possible, or in competition, aiming for maximum concentration at impact, and maintaining the eyes-head position timed correctly in order to see the next impact and maintain the rally (image 8).	
	Hitting or rallying with less or more time to prepare (image 9).	



Image 4. Throwing the fitball to a service box.



Image 5. Hitting from different court zones towards a big target.



Image 6. Hitting backhand towards a small target.



Image 1. Medicine ball throw.



Image 2. Hitting with a toning ball on a balance disk (right and left).



Image 3. Forehand and backhand movements on unstable surface (fitball).



Image 7. Hitting the ball after throwing the medicine ball, (see image 1), looking for transference.



Image 8. Competition match under pressure.



Image 9. Rallying volleys with little time to keep the eye-head-contact connection.

Photographer: Laida Jauregui Salvia (Except image 8).

CONCLUSIONS

The outcome of the research shows a direct relationship between the stability and maintenance of the position of the head with the experience and level of the players. Furthermore, fixing the “gaze” on the impact zone, helps to increase attention and improve accuracy when hitting towards a target and under pressure.

It is therefore key to bear in mind that the vision of the ball plays a fundamental role in stroke production, that is why it is key to train this from an early age.

REFERENCES

- Elliott, B., Reid, M. & Crespo, M. (2009). El desarrollo de la técnica en la producción de los golpes de tenis. ITF The international tennis federation, Ed. Primera.
- Giblin, G., Whiteside, D. & Reid, M. (2017). Now you see, now you don't ... the influence of visual occlusion on racket and ball kinematics in the tennis serve. *Sports Biomechanics*, 16(1), 23–33.
- Keller, J. & Ripoll, H. (2006). Cognition and the emergence of coordination in performing hitting a tennis ball in nine-year-old children. *Trends in learning research*, chapter 7, pp. 139–170.
- Lafont, D. (2008). Gaze control during the hitting phase in tennis: a preliminary study. *International Journal of Performance Analysis in Sport*, 8(1), 85–100.
- Luis del Campo, V., Reina, R., Sabido, R., & Moreno, F. J. (2015). Diferencias en el comportamiento visual y motor de tenistas en laboratorio y en pista de tenis. *Revista Latinoamericana de Psicología*, 47(2), 136–145.
- Shafizadeh, M., Bonner, S., Fraser, J., & Barnes, A. (2019). Effect of environmental constraints on multi-segment coordination patterns during the tennis service in expert performers. *Journal of sports sciences*, 37(9), 1011–1020.

RECOMMENDED ITF TENNIS ACADEMY CONTENT (CLICK BELOW)



Preoccupation with results can be damaging for young coaches

Callum Gowling (GBR)

ITF Coaching and Sport Science Review 2020; 82 (28): 9-11

ABSTRACT

Sports coaching research can portray an overly simplistic picture of the activity leading to young coaches being underprepared for intra-personal conflicts during coaching careers (Cushion, 2006; Jones, 2009; Potrac et al., 2016). This paper builds on work that shows coaching is emotionally challenging (Thelwell, 2017; Gowling, 2019). Autoethnography illustrates the first authors inner struggles with their perceived effectiveness while trying to prove their worth in the elite junior coaching context. There are four main findings (1) the performance narrative influences young coaches' behaviour; (2) inability to assess one's own effectiveness, without using player results as the sole criteria can have a negative emotional effect on coaches; (3) relational narratives are present in elite junior coaching; (4) provides governing bodies with opportunities to improve the preparation of young coaches for intra-personal challenges related to coaching.

Key words: Autoethnography, emotional challenges, young coaches.

Corresponding author: callumgowling@btinternet.com

Article received: 10 Jun 2020

Article accepted: 02 Sep 2020

INTRODUCTION

Researchers argue that coach education does not effectively use the wealth of experience that coaches have to inform the education of new coaches, leaving them underprepared for the complex nature of their role (Cushion, Armour, & Jones, 2003). New approaches to research, such as autoethnography, lead research away from abstract theorising about coaching, towards more “thickly described, evocative accounts of coaching” practice and culture by using first person accounts of coaching (Geraity, 2014, p. 206). Highly personalised, vulnerable writing followed by theoretical analysis is an effective way for existing coaches to communicate their experiences and inform practice. Autoethnography can inform tennis coach education literature through a vivid insight into emotional challenges that tennis coaches may face.

The purpose of this paper is to provide a first-person account of a coaching relationship with an elite junior tennis player (Junior ITF level) and illustrate how an over reliance on results (performance narrative) influenced my coaching behaviours. The performance narrative is a story of single-minded dedication to sport performance to the exclusion of other areas of self, and relationships (Douglas & Carless, 2012). Within the plot of the performance narrative, winning, results, and achievements are pre-eminent and link closely to the storyteller's mental well-being, identity, and self-worth. The storyline of the performance narrative is consistent with sport is life and life is sport, and the performance narrative permeates much of junior elite sport participation (Dacyshyn, 1999). The story charts my early experiences as a tennis coach trying to prove that I belonged as a coach to elite junior tennis players. I became fixated on winning as the primary measure of my effectiveness as a coach. With player results suffering and no alternative way of assessing my effectiveness as a coach, I experienced struggles with self-worth, and this affected the coach-athlete relationship through an inability to cope.

METHOD

The autoethnography is about my personal thoughts and experiences of coaching an elite junior tennis player. I present highly personalised stories as three, sequential, diary entries, illustrating an important series of events during the coaching relationship with Sarah (name changed for anonymity).

Analytic autoethnography uses the self as a means to a theoretical end. Authors communicate their experience through stories



and include straightforward interpretation of their stories. The interplay between the story and interpretation leads to theoretical insight. This paper tells a story about my emotional struggles during a difficult period in the coaching relationship. After a period of immersion into the data, it became clear that the scaffold and structure holding the stories together was the performance narrative and how I lived that through my coaching identity.

RESULTS

I present the results as diary extracts from a personal coaching journal to reflect the day's events and how I, as the coach, tried to make sense of my experiences.

Story 1 – Results show me that I am failing.

I'm struggling on court right now. Results haven't been great and the changes I've made to Sarah's game aren't working. I'm concerned whether the changes are the right ones now. Is it me or is it her? I can't help but worry about what her parents think about my coaching? The improvements seem to be harder to come by and the early success we had together seem a distant memory. Her dad wants a catch up and I'm convinced he's gonna get rid of me.

I went to their house while Sarah was at school and mum was at work. The fact no-one else was around made it even more scary. This obviously isn't gonna be good, he's gonna tear a strip off me for all the poor results. We chatted over coffee and politely

danced around Sarah and her tennis. After the first coffee, he tops me up and sits back down and there is an awkward silence. Here comes the bullet.

He tells me they are up against it financially and he is thinking of downsizing their house to help pay for the tennis. My brain went into overdrive, thinking about what was coming next. Surely, he is going to tell me now that they are sending her to an academy and investing in 'better coaching'... The words never came. I was not sure if he wanted reassurance that I was the right man for the job or if he wanted me to tell him to stop her tennis. I'm just a tennis coach, am I meant to know how to respond in this situation?

He told me that he really appreciated the work I was doing, and I had a positive effect on her way beyond the tennis court. He wanted me as coach no matter what. I thought, "Appreciate the work I'm doing? She's been losing!"

Story 2 – My inability to cope.

I picked Sarah up from school and brought her to the centre. I had a lesson beforehand with a different player. I can see Sarah sat down, chatting away without a care in the world. "Where is the warm-up please? You're on in 20 mins and you're not looking too ready". My attention is now not on my current lesson, I'm consumed with frustration because of the lack of discipline. 10 minutes to go, still no movement... "Come on Sarah, show me something!" As I finish my lesson I am consumed with frustration with Sarah. What am I going to say to her? I can't be responsible for her missing school and her not showing discipline. What will her parents think of this? Is this just a jolly? Do something about it!

Sarah walked onto court, oblivious to my mood. I imagined all her rivals and what their warm-ups would be in the same situation. Early to practice, energetic, dynamic, organised, disciplined... Perfect. I described the scene to Sarah, over exaggerating what I imagined the perfect warm-up to be and then compared it to what I had witnessed from her. She clearly felt that these days out of school were no more than an opportunity to revel in her own self-importance. Coming out of school just to sit and chat to whoever! Disgrace. All this effort I've gone to, to get you here for your tennis and that's what you do.

I finished my rant and left the court for Sarah to come off court on her own. Her eyes were red, and she made no eye contact. As I left the court the frustration drained from my body, leaving only shame. Who was that speaking? Am I really that person? I sat slumped in the clubroom; deflated, conflicted, disappointed, and reflected on the performance I just put on. I went over all the negative stereotypes of performance coaches I had created over the years when I played. I ticked every box.

Story 3 – Understanding that results aren't everything.

The fallout from that last session has been quite something. I lost the trust and respect of her parents and Sarah is currently working with another coach. Every time I see her it's a reminder of what an idiot I was in that moment and how self-absorbed I had become. Who were my actions really helping? I'm embarrassed.

I still see Sarah, but she clearly feels awkward as we just politely wave nowadays. The awkwardness only makes me feel worse about my behaviour. I saw her today and she was leaving for an ITF. In between my own sessions I felt the need to clear the air with her before she left.

I call her over. As she walks over, I feel sick. Sick at the thought of having to apologise to a teenager for my actions as a supposed mature adult. This feels really humiliating.

I hold nothing back. I'm not so sure any of this is in any coaching manual, "how to apologise to your former players", but it's all I know. Admit your mistakes and treat everyone like you would want to be treated. Sarah is giving me eye contact and does not appear to be gloating – which I'd imagined before embarking on this apology. Once I got most of the painful admissions out of the way, which merely alluded to my own insecurities as a coach, Sarah's facial expressions began to relax, and she looked more like the person I used to coach. The one with an air of mischief around her. "It's all fine Cal. Now can you have a word with my dad and get me back on court with you again coz he's doing my head in".

DISCUSSION

The stories in this paper contribute to our understanding of coaching in several ways:

First, the stories show the performance narrative strongly influenced my coaching attitude and I had a preoccupation with positive results because I believed this would prove my competence. A period of poor results meant I perceived my coaching negatively and believed others within tennis would judge me as ineffective. The stories contribute to research that says new coaches are over reliant on results as proof of effectiveness (Peet et al., 2013; Cassidy et al., 2016) and seeking positive public judgements from others in tennis dominate the daily thoughts and actions of young coaches (Kelchtermans, 2009a).

Second, the stories show how over-reliance on results as a source of confidence can damage self-esteem and self-worth during periods of poor results. The stories show an interplay between the performance narrative and the insecurities of a young tennis coach when trying to develop a socially recognised identity as an effective coach. Poor results and my resultant insecurity produced negative coaching behaviours towards Sarah. The stories contribute to research that highlights coach stress and the potential negative impact on coach-athlete relationships (Thelwell et al., 2017).

Third, the stories show evidence of a young coach learning a new coaching narrative. Relational narratives use care and connectedness to assess effective coaching relationships rather than focussing on results (Douglas & Carless, 2012). The stories help to show players, coaches, and parents use different criteria to assess coaching relationships. For example, care, connection, and relationship duration are markers of successful coaching relationships, as well as winning. The paper builds on work highlighting that coaches involved in youth sport must use sport effectively to meet the needs of athletes, "rather than simply assuming that pushing them through sports experiences will in some magical way, result in positive outcomes for all of them" (Armour, 2013, p. 20).

Finally, this paper provides governing bodies with opportunities to improve the preparation of young coaches for intra-personal challenges related to coaching. There are potential shared world meanings from my experiences that may reassure new or existing coaches about their own coaching experiences.

CONCLUSION

My story showed how the performance narrative influenced my early coaching career. My attempt to create a positive reputation as an effective coach caused issues with professional self-understanding and relationships with a player. My story shows that I used the performance narrative to inform my tennis coaching role, and this was influential in my preoccupation tournament results. Interactions with Sarah and her parents

contradicted the performance narrative but my rigid adherence to the performance narrative resulted in negative coaching behaviours that contributed to the breakdown of the coaching relationship. My story also shows how reflecting on my coaching helped me to learn and understand a new relational narrative in the elite junior coaching context. I hope the in-depth depictions of my coaching stories provide a catalyst for more autoethnographies into tennis coaching, which lead to more realistic depictions of coaching practice.

REFERENCES

- Armour, K. (2013) *Sport Pedagogy: An Introduction for Teaching and Coaching*. Abingdon: Routledge.
- Cushion, C. (2006). Modelling the Complexity of the Coaching Process. *International Journal of Sports Coaching*, Vol 2 (4), pp 395 – 400.
- Cushion, C.J., Armour, K.M. and Jones, R.L., (2003). Coach Education and Continuing Professional Development: Experience and Learning to Coach, *Quest*, 55, 215-230.
- Dacyshyn, A. (1999). When the balance is gone. In J. Coakley and P. Donnelly (Eds.) *Inside sports*, (pp.214-222). London: Routledge.
- Douglas, K. & Carless, D., (2012). Stories of success: Cultural narratives and personal stories of elite and professional athletes, *Reflective Practice: International and Multidisciplinary Perspectives*, 13:3, 387-398, DOI: 0.1080/14623943.2012.657793.
- Geraity, B. T. (2014) 'Autoethnography. In L. Nelson, R. Groom, & P. Potrac, (Eds) *Research Methods in Sports Coaching*, pp 205 – 216. Abingdon: UK, Routledge.
- Gowling, C. (2019). Understanding the pressures of coaching: In sights of young UK coaches working with elite junior tennis players. *ITF Coaching & Sport Science Review*, Vol 79, pp 19 – 21.
- Jones, R. L. (2009) Coaching as caring (the smiling gallery): accessing hidden knowledge, *Physical Education and Sport Pedagogy*, 14:4, 377-390, DOI: 10.1080/17408980801976551.
- Kelchtermans, G. (2009a). Who I am in how I teach the message: Self-understanding, vulnerability, and reflection? *Teachers and Teaching: Theory and Practice*, 15(2):257-272.
- Peel, J. Cropley, B. Hanton, S. & Fleming, S. (2013) Learning through reflection: values, conflicts, and role interactions of a youth sport coach, *Reflective Practice*, 14:6, 729-742, DOI: 10.1080/14623943.2013.815609.
- Potrac, P. Jones, R. Nelson, L. (2014). Interpretivism. In: Nelson, L. Groom, R. Potrac, P. (ed.), *Research Methods in Sports Coaching*, Abingdon: UK, Routledge.
- Thelwell, R. Wagstaff, C. R. D. Chapman, M. T. and Kenttä, G. (2017) Examining coaches' perceptions of how their stress influences the coach-athlete relationship, *Journal of Sports Sciences*, 35:19, 1928-1939, DOI: 0.1080/02640414.2016.1241422.

RECOMMENDED ITF TENNIS ACADEMY CONTENT (CLICK BELOW)



Tennis masters. Nitto vs Next Generation ATP Finals

Alejandro Sánchez-Pay, José Julián Navarro-Cuenca & Bernardino J. Sánchez-Alcaraz (ESP)

ITF Coaching and Sport Science Review 2020; 82 (28): 12-14

ABSTRACT

The objective of this study was to know the influence of the modification of the tournament regulations between the 2019 Nitto ATP Finals and Next Gen tournaments in relation to physical and technical parameters. In order to do this, 100% of the sets played (34 of the Nitto ATP Finals and 55 of the Next Gen) of a total of 30 matches were analysed. The data was selected from the information published on the Official Website of the Tennis ATP (<https://atp.com/>). The results of this study show that the specific tournament regulations in the Next Gen ATP Finals (matches to the best of 5 sets of four games, elimination of the advantages and use of the "golden point", and the no-let rule) could influence the duration of the match and the number of total break opportunities, although not significantly. The percentage of first serves was similar between both tournaments, so despite including the no-let rule, the time interruptions between the first and second serves were equivalent.

Key words: performance analysis, racquet sports, professional tennis, competition, statistics.

Corresponding author: aspay@um.es

Article received: 30 Jun 2020

Article accepted: 20 Sep 2020

INTRODUCTION

Performance analysis (notational analysis or match analysis) aims to record and analyse behaviours and actions of athletes in real game situations. These types of indicators or variables that best represent the winner of a match may vary depending on the playing surface (Barnett, Meyer, & Pollard, 2008; Collinson & Hughes, 2003) or the gender of the players, among other aspects (Brown & O'Donoghue, 2008).

The ATP, as well as the different Grand Slam tournaments, include on their websites very detailed information on the actions that take place during the course of the match (Cross & Pollard, 2009). These data allow for subsequent further analysis of higher quality (Katić, Milat, Zagorac, & Durovic, 2011) which can be used to determine different influential aspects in the game.

The Masters Cup (current Nitto ATP Final) is the tournament that includes the 8 best players classified by ranking and has special interreturn due to its particular format (two groups of four players face each other in league format, the two being classified first of each group for the semi-finals), as well as the competition between the best players of the season. Since 2017, the ATP created a tournament similar to the masters Cup, which is played by the top 8 ranked in the ATP ranking under the age of 21, called Next Generation (Next Gen) ATP Final. This tournament has different regulations, such as: a) games played to the best of five sets, b) shorter sets format, best of four games with tie-break at 3-3, c) "golden point", and d) continuous play with the serve (no-let rule). These changes have the intention of creating a high-speed, cutting-edge format, to suit the needs and demands of television, and which is aimed to attract new and young sports fans. However, there is currently no study that has analysed the influence of the regulation changes of this 21&U tournament on the statistics of the competition. Therefore, the objective of this research will be to observe the differences between the Nitto and Next Gen ATP Finals tournaments, as well as to analyse the influence of the modification of the tournament regulations on the demands of the competition.

METHOD

Sample

The sample consisted of a total of 89 sets from the 2019 ATP Final tournaments (34 sets of Nitto and 55 sets of Next Gen). All matches included in each tournament were recorded and analysed.

Procedure

The statistics of the matches played in the Nitto ATP Finals tournament ($n = 15$ matches; 34 sets) and in the Next Gen ATP Finals tournament ($n = 15$ matches; 55 sets) were collected. The data was selected from the information published on the Official Website of the Tennis ATP (<https://atp.com/>). The selected variables were grouped into three blocks: temporal variables and game actions, variables related to performance on the serve and variables related to performance on the return of serve.

Statistical analysis

Firstly, the mean (M) and standard deviation (DT) were calculated on all the variables in the sample. Normality analysis was performed using the Kolmogorov-Smirnov test. The t-Student test was used to identify the differences between tournaments (Nitto ATP Finals and Next Gen ATP Finals) as well as to calculate the mean and percentage difference between the winner and loser between both tournaments. A significance level of $p < .05$ was established. The data was analysed using the IBM SPSS 20.0 statistical package for Macintosh (Armonk, NY: IBM Corp.).

RESULTS

Table 1 shows the differences in the physical parameters (points played, match duration, etc.) and in the variables related to the serve and the return depending on the tournament (Nitto and Next Gen ATP Finals).

Table 1. Differences between Nitto and Next Gen ATP Finals.

	Nitto M (DT)	Next Gen M (DT)	Dif	p
General variables				
Match duration (min)	106.8 (39.51)	84.53 (20.88)	22.27	.064
Set duration (min)	47.12 (12.14)	23.05 (5.24)	-24.06	.000
Sets palyed	2.35 (0.49)	3.71 (0.60)	-1.36	.000
Total P. played (per match)	147 (43.5)	122.27 (28.77)	24.73	.077
Total P. played (per set)	64.85 (14.13)	33.35 (7.09)	31.50	.000
Games played (per set)	10.35 (2.00)	5.93 (0.94)	4.24	.000
Service-related variables				
Aces	13.8 (4.71)	9.6 (4.97)	4.20	.025
Double faults	3.47 (2.07)	3.00 (2.07)	0.47	.542
Ratio ace : double faults	5.24 (3.46)	4.65 (4.47)	0.59	.691
Points played 1 st serve	96.47 (25.36)	78.07 (17.29)	18.40	.028
1 st serve (%)	66.24 (4.11)	64.54 (7.32)	1.70	.439
P. Won 1 st serve	71.33 (20.97)	56.67 (13.69)	14.66	.031
P. Won 1 st serve (%)	73.49 (6.6)	72.33 (5.71)	1.15	.613
P. Played 2 nd serve	50.53 (19.27)	44.2 (15.61)	6.33	.331
P. Won 2 nd serve	27.00 (10.4)	23.53 (9.72)	3.46	.354
P. Won 2 nd serve (%)	53.53 (5.88)	52.24 (6.08)	1.28	.561
P. Won serving	98.33 (30.23)	80.2 (19.65)	18.13	.062
P. Won serving (%)	66.73 (5.17)	65.47 (4.05)	1.25	.465
Variables related to the return				
P. Break points won	3.4 (1.8)	4.27 (1.71)	-0.87	.118
P. Break points played	8.6 (4.36)	11.47 (5.05)	-2.86	.107
P. Break points won (%)	44.33 (23.05)	43.83 (22.19)	0.49	.953
P. Won returning	48.67 (15.64)	42.07 (10.82)	6.60	.190
P. Won returning (%)	33.27 (5.17)	34.53 (4.05)	-1.25	.465

Legend. M: mean; DT: standard deviation; Q: points.

Table 2 shows the difference in average values between the winner and the loser of each tournament, as well as the comparison between both tournaments. The winners in Next Gen had 17% more points won per set than the losers, while the winners in Nitto had 11% more points than the losers, showing significant differences between both winners ($p = .037$).

Table 2. Comparison between tournaments depending on the mean differences in the performance of the players (win / lose).

Variables	Nitto M (DT)	Next Gen M (DT)	F	p
General variables				
Games won	2.24 (1.13)	2.16 (0.90)	0.110	.741
P. Won per match	6.44 (4.15)	5.09 (3.03)	3.135	.080
P. Won per set (%)	11.69 (9.99)	17.22 (13.04)	4.487	.037
Variables related to service performance				
Aces	0.5 (3.05)	-0.15 (1.86)	1.544	.217
Double faults	-0.24 (1.33)	-0.16 (1.00)	0.084	.773
Aces / double faults ratio	0.74 (3.44)	0.02 (2.04)	1.527	.220
1st serve (%)	-0.13 (12.84)	-0.47 (19.13)	0.008	.928
P. Won 1st serve (%)	11.09 (14.10)	17.41 (19.53)	2.691	.105
P. Won 2nd serve (%)	13.9 (28.61)	18.81 (26.9)	0.663	.418
P. Won serving	3.21 (4.16)	2.35 (2.09)	1.675	.199
Variables related to return performance				
Break point (%)	35.88 (46.38)	50.48 (44.48)	2.192	.142
P. Won returning	3.24 (5.57)	2.75 (2.98)	0.292	.591

Legend. M: mean; DT: standard deviation; p = level of significance.



DISCUSSION

The rules and systems of competition in professional tennis have evolved in recent years. Some of the most significant changes include: the Davis Cup changed the system of playoff teams in 2019, the four Grand Slam had in 2019 a different regulation for the tie-break on the fifth set, or the inclusion of the golden point in all games of the doubles competition, with a supertiebreak in the third set. However, perhaps the tournament Next Gen ATP Finals is the one which includes more differentiating regulation changes to the Nitto ATP Finals, with matches played to the best of 5 sets with four games per set, the elimination of the advantages with the "golden point", and the inclusion of the no-let rule.

As expected, the new competition format of the Next Gen tournament reduced the number and duration of sets, as well as the number of points and games played per set (Table 1). On the other hand, and although the duration of the match and the number of total points were lower in the Next Gen tournament when compared to the Nitto ATP Finals, these differences were not significant ($p > .05$). Thus, it could be argued the rule of including shorter sets of four games decreases the duration of the set, but not so significantly the duration of the match.

With regard to the serve statistics, fewer points played and won with the 1st serve were observed in the Next Gen as compared to the Nitto ATP Finals, which could be the cause also of the fewer number of aces in played this tournament. However, the data collected did not analyse the information related to the situation of the not let rule in the service, therefore, it cannot be concluded that these results are produced by the let rule. However, despite being able to serve without a let, in Next Gen matches no more aces were made, nor were higher values obtained in the number of points played with the first service or in the percentage of points won with the first service.

On the other hand, in the Next Gen event the number of break points won and played increased when compared to the Nitto (though not significantly). Therefore, despite including the golden point rule and playing fewer games per set (6 vs 10), from a statistical point of view, the number of opportunities to break in a match does not seem to increase.

Furthermore, the data from this study showed differences in the statistics between the winners and losers of the matches, as analysed by previous studies (Ferjan, 2001; Quereda-Sánchez, Courel-Ibáñez, Sánchez-Pay, Alfonso-Asencio & Sánchez-Alcaraz, 2020). It was observed that the winners of the matches in the Nitto tournament won approximately more than two games and six points per match than the losers, with very similar differences in the Next Gen tournament (Table 2). Significant differences were only found in the percentage of points won per set, with a difference of 5.5% between both tournaments. Therefore, in general, and given the similarity of values about the mean difference of winners over losers in each one of the two tournaments, the data confirmed a similarity in the statistics related to the performance of the players according to the match result in both tournaments (table 2).

The results of this study have an important practical application for coaches and players in the design of training sessions and the preparation of matches adapted to the specific demands of the competition. For example, a good tactical and mental preparation of the points called key moment (such as the golden point) seems decisive, since it has been shown to be the influence of the marker (winning, drawing or losing), in addition to the importance of the type of point played can influence decision-making at pressure, affecting performance (Mesagno, Geukes & Larkin, 2015).

CONCLUSIONS

The results of this study show that the special regulations of the Next Gen ATP Finals tournament could influence the duration of the match and the number of total break opportunities, although not significantly. The percentage of first serves was similar between both tournaments, so despite including the no-let rule, the time interruptions between the first and second serves were equivalent.

REFERENCES

- Barnett, T., Meyer, D., & Pollard, G. (2008). Applying match statistics to increase serving performance. *Medicine and Science in Tennis*, 13(2), 24–27.
- Brown, E., & O'Donoghue, P. (2008). Gender and surface effect on elite tennis strategy. *ITF Coaching and Sport Science Review*, 46, 9–11.
- Collinson, L., & Hughes, M. D. (2003). Surface effect on the strategy of elite female tennis players. *Journal of Sports Sciences*, 21(4), 266–267.

- Cross, R., & Pollard, G. (2009). Grand slam men's singles tennis 1991-2009 serve speeds and other related data. *ITF Coaching and Sport Science Review*, 16(49), 8–10.
- Ferjan, R. (2001). Comparison of game characteristics of final matches at the US and Australian Opens in 2000 and 2001. University of Ljubljana, Faculty of Sport. Ljubljana
- Katić, R., Milat, S., Zagorac, N., & Djurović, N. (2011). Impact of game elements on tennis match outcome in Wimbledon and Roland Garros 2009. *Collegium Antropologicum*, 35(2), 341–346.
- Mesagno, C., Geukes, K., & Larkin, P. (2015). Choking under pressure: A review of current debates, literature, and interventions. In S. D. Mellalieu y S. Hanton (Eds.), *Contemporary advances in sport psychology: A review* New York: Routledge.
- Quereda-Sánchez, I., Courel-Ibáñez, J., Sánchez-Pay, A., Alfonso-Asencio, M., & Sánchez-Alcaraz, B.J. (2020). Diferencias en las estadísticas de competición en tenis en el Abierto de Australia 2019 en función del género y del resultado del partido. *Acción Motriz*, 24, 29-35.

[RECOMMENDED ITF TENNIS ACADEMY CONTENT \(CLICK BELOW\)](#)



Serve routine preparation: Benefits of a combination of imagery, ball bounce and breathing on performance

Laurent Dominique & Nicolas Robin (FRA)

ITF Coaching and Sport Science Review 2020; 82 (28): 15-16

ABSTRACT

The objective of this study was to test the benefit of consistent training in developing and using individualized service preparation routines composed in particular of motor imagery, ball bounce and breathing in order to provide practical recommendations to coaches. The results show an improvement in the percentage of first serve and effectiveness in experienced players.

Key words: service, routine, mental imagery, tennis.

Corresponding author: robin.nicolas@hotmail.fr

Article received: 1 Jul 2020

Article accepted: 20 Sep 2020

INTRODUCTION

Motor Imagery (MI) is a conscious process that involves mental stimulation of a motor action (Robin et al., 2007). It is a technique mostly used by coaches, in addition to actual practice, to improve the performance of tennis players (Guillot, Desliens, Rouyer, & Rogowski, 2013). MI is done on the action that base on the mental representations that build from the body with sensory modalities or the environment such as visual images (Dana & Gozalzadeh, 2017; Robin & Joblet, 2018). As the MI allows to regulate players attention, it is frequently integrated into their performance routines (Le Scanff, 1999) especially in order to focus their attention on other elements than the technique of the stroke that they will perform and allow them to initiate their movement under standardised conditions as possible (Jackson & Baker, 2001). For example, before serving, it is common to see professional players taking a deep breath in and out or bouncing the ball a number of times as shown in the photo.

Similarly, some players do MI before serving because this technique has shown positive effects on performance (Desliens, Guillot, & Rogowski, 2011; Fekih et al., 2020; Guillot, Genevois, Desliens, Saieb, & Rogowski, 2012; Mamassis, 2005). For example, Guillot et al. (2013) showed that the combination of physical practice and MI, with focus on the ball trajectory, had improved speed and accuracy of service. All previously mentioned elements lead us to think that it would be beneficial, for advance players, to create, stabilize and based particularly in MI use serve routines on an external focus. The purpose of this experiment was to assess the influence of a routine that prepare a serve that made up with of deep breathing, a number of personalized ball bounces and MI.

METHOD

Twenty two tennis players (M = 16.9 years) training at the HDN Academy in Nîmes voluntarily participated in this study. They were divided into 2 groups: control and imaging routine.

PROCEDURE

During 5 months, the players carried out 20 sessions of 1.5 hours during which, after the warm-up, they had to serve 25 times in match condition. The imaging routine group was instructed, before each first serve, to use a routine made of breath in then a deep breath out, then a certain number of ball bounces at the same time as the MI which was to visualize the trajectory and the zone bounce of the ball. The control group did not receive any specific instructions.

During the first session, players carried out the test 1:25 first serve in match condition. The percentage of success, the speed



of the balls (with a radar) and the efficiency (scores ranging from "0" ball in the net or fault to "5" ace) of each serve were recorded by 2 state certified coaches. At the end of the 20 sessions, the players took test 2 identical to test 1.

RESULTS

The statistical analysis performed on the speed of the balls did not show a significant difference between the services of the control group (average = 149 km / h) and those of the routine imagery group (average = 155 km / h) at the test. 2.

On the other hand, the results show that the players in the routine imagery group improved (between test 1 and test 2) their first ball pass percentage by 15% while that of the players in the control group remained stable. In addition, the players who used the routine serve preparation (routine imaging group) obtained a higher success rate at first balls than those who did not use routine (control group) during test 2 (see figure below).

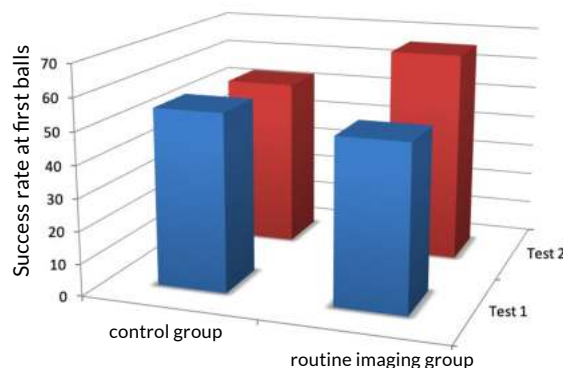


Figure 1.

Finally, the players in the imagery group improved the efficiency of their first serve balls between test 1 and test 2, and served more effectively than those in the control group in test 2 (see figure below).

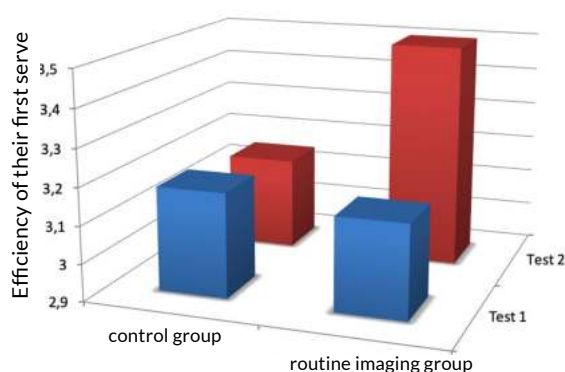


Figure 2.

DISCUSSION

This experiment was carried out to assess the effects of the serve routine preparation, repeated and stabilized in training in match conditions, combining breathing, individualized ball bounce and MI focused on the trajectory of the ball and the target area to reach. The results obtained show a significant improvement in the percentage and efficiency of the first serve in players who have benefited from an imaging routine. These results confirm those of previous studies which have shown the beneficial effect, in tennis, of combining MI with real practice both by advance players and beginner (Coelho et al., 2007; Guillot et al., 2012; Fekih et al., 2020; Robin et al., 2007; Robin et al., 2019). In addition, our results are in line with the work of Guillot et al. (2013) who showed the positive effects of MI, with external focus, i.e. the player is asked to visualize the trajectory of the ball that he wants to serve and the target he wishes to reach. We recommend coaches rather to ask players to focus on the effects and consequences of their serve than technical stroke (Wulf et al., 2002). Finally, this experience underlines the benefit of integrating deep breathing into the MI Serve routine preparation, allowing the player not to focus on negative thoughts or parasitic images (Clark, Lockett, & Kirkendall, 2010; Jackson & Baker, 2001). On the other hand, it seems that the use of the bounce of the ball, whose control is automated, favors the use of external attentional focus during MI (Dominique, 2005).

CONCLUSION

The results of this field study, carried out under match conditions, show that the use of the serve routine preparation with breathing, individualized ball bounce and MI improves efficiency and the percentage of the first ball success. We recommend that coaches develop and generalize the use of the first serve routine preparation.

REFERENCES

- Coelho, R. W., De Campos, W., Da Silva, S. G., Okazaki, F. H., & Keller, B. (2007). Imagery intervention in open and closed tennis motor skill performance. *Perceptual Motor Skills*, 105, 458–468.
- Dana, A., & Gozalzadeh, E. (2017). Internal and External Imagery Effects on Tennis Skills Among Novices. *Perceptual and Motor Skills*, 124(5), 1022–1043.
- Desliens, S., Guillot, A., & Rogowski, I. (2011). Motor imagery and serving precision: A case study. *ITF Coaching and Sport Science Review* 55, 9–10.
- Dominique, L. (2005). *La préparation mentale : approche théorique et pratique en tennis*. Thèse de doctorat, Université de Paris XI, Paris.
- Fekih, S., Zguira, M. S., Koubaa, A., Masmoudi, L., Bragazzi, N. L., & Jarraya, M. (2020). Effects of Motor Mental Imagery Training on Tennis Service Performance during the Ramadan Fasting: a Randomized, Controlled Trial. *Nutrients*, 12(4), E1035.
- Guillot, A., Genevois, C., Desliens, S., Saieb, S., & Rogowski, I. (2012). Motor imagery and 'placebo-racket effects' in tennis serve performance. *Psychology of Sport and Exercise* 13, 533–540.
- Guillot, A., Desliens, S., Rouyer, C., & Rogowski, I. (2013). Motor imagery and tennis serve performance: The external focus efficacy. *Journal of Sports Science and Medicine*, 12(2), 332–338.
- Jackson, R.C. & Baker, J.S. (2001). *Routines, rituals, and rugby: Case study of a world class goal kicker*. Human Kinetics Publishers, Inc.
- Le Scanff, C. (1999). Les routines de performance, dans Le Scanff (C.), Famose (J.-P.), *Gestion du stress : entraînement et compétition*, Paris, EPS, p. 54–60.
- Mamassis, G. (2005). Improving serving speed in young tennis players. *ITF Coaching and Sport Science Review*, 35, 3–4.
- Robin, N., Dominique, L., Toussaint, L., Blandin, Y., Guillot, A., & Le Her, M. (2007). Effects of motor imagery training on service return accuracy in tennis: The role of imagery ability. *International Journal of Sport and Exercise Psychology*, 2, 177–188.
- Robin, N., & Joblet, E. (2018). L'imagerie mentale en EPS et si on essayait ? *Enseigner l'EPS*, 275, 5–9.
- Robin, N., Toussaint, L., Charles-Charlery, C., & Coudeville, G.R. (2019). Free Throw Performance in Intermediate Basketball Players: The Effect of Dynamic Motor Imagery with and without a Video of a Model. *Learning and Motivation*, 68.
- Wulf, G., McConnel, N., Gärtner M., & Schwarz, A. (2002). Enhancing the learning of sport skills through external-focus feedback. *Journal of Motor Behavior*, 34, 171–182.

RECOMMENDED ITF TENNIS ACADEMY CONTENT (CLICK BELOW)



Pearls of Wisdom from Rod Laver, AC, MBE

Janet A. Young (AUS)

ITF Coaching and Sport Science Review 2020; 81 (28): 17-18

ABSTRACT

This paper reviews Rod Laver's game and the role of his first coach from Rod's own perspective, as reported in his autobiography, Rod Laver: A Memoir. Several implications for coaches are proposed.

Key words: biography, coaching, mentoring, methodology.

Corresponding author: janet_young7@yahoo.com.au

Article received: 14 Jul 2020

Article accepted: 30 Oct 2020

INTRODUCTION

"Few sports have a longer or richer history than tennis and no player occupies a bigger part of that history than Rod Laver. From my earliest tennis memories, Rod 'the Rocket' Laver stood above all others as the greatest champion our sport has known" (Roger Federer, 2013).

Much has been written about Rod Laver with many, including Roger Federer, recognising him as *"the world's greatest tennis player"* (Laver & Writer, 2013, p. xii). Growing up in Australia with Rod as my hero, I never dreamed our paths would cross on the court. Yet they did when Rod was Player/Coach of the San Diego Friars in World Team Tennis, a US-based team competition. Whilst Rod was retired from the professional circuit at the time, he was still an amazing champion who regularly produced incredible shots in his matches. *"You should have seen the shots Rod Laver hit"* was so often audible by the captivated audience. My special memories of Rod include playing mixed doubles with him in these team matches and being spell-bound by the sincerity, clarity and positivity of his advice as team coach. It was therefore very special when Rod gave me a signed copy of this autobiography, Rod Laver: A Memoir. On the front page he had written, *"Janet. It's always great being with you"*.

It is now several years since I first read Rod's autobiography. The recent COVID-19 lockdown gave me time to revisit the book, and again, marvel at Rod's incredible journey from humble beginnings growing up in a Queensland country town. I was particularly intrigued by Rod's own accounts of his game, strengths and glowing attributes to his first coach, Charlie Hollis. Before sharing these with you, I will briefly summarise Rod's key tennis achievements.

TENNIS ACHIEVEMENTS

In an amazing list of achievements, Rod won 11 Grand Slam singles titles - three Australian, two French, four Wimbledon and two US Opens - and is the only player to twice achieve the calendar-year Grand Slam - in 1962 and 1969. In addition, he won eight 'Pro Slam' titles and played in five victorious Davis Cup titles. Rod's overall tally of 200 singles titles is unmatched in tennis history. He held the world's top singles ranking from 1964 to 1970.

The naming of the main arena at Melbourne Park, home of the Australian Open, as Rod Laver Arena in 2000 is a fitting testament to Rod's contribution to the game. In a recent initiative driven by Roger Federer to honour his own legend, the Laver Cup was started in 2017.

DISSECTING GREATNESS

Throughout his autobiography Rod offers snippets into the composition of his greatness. One particularly revealing passage is his reflection on his game,



"I could adapt my style to all surfaces and conditions ... and my fitness and unflustered mindset enabled me to prevail ... I was unflappable on the court in my mind and my body language. I did not dwell on it if I played a bad shot; it was instantly in the past ... I rarely made eye contact with or reacted in any way to my opponent. I kept it impersonal and unemotional on the court" (p.93).

In another revealing passage Rod describes his love of tennis. This love appears to be 'the glue' that effortlessly bound his energies, motivations and dreams.

"I loved tennis. It seemed the natural game for me to play. I played in the rain and the wind and under the blazing Queensland sun... What I loved was the satisfaction of hitting the ball sweetly, the running to ram home a point or save one, the one-on-one combative nature of the game, facing up to an opponent and testing yourself against him" (p.9-10).

Further clues to explain Rod's greatness point to a range of possible explanatory factors. These include Rod's natural competitiveness and unshakeable self-belief; a commitment to be fitter than his opponents; and a mindset to never give up, change a losing game, respect opponents and keep things in perspective. For Rod, *"tennis was a game, not a war"* (p.104); there were valuable lessons to be learned in defeat and the *"sun would still rise tomorrow"* (p.111).

There are many interesting illustrations of these contributing factors in the book. For example, the strengthening of Rod's left forearm and wrist by relentlessly squeezing squash balls, and endless push-ups and double-knee jumps to be super-fit, are gleefully described. The reader can almost see Rod smile as he recounts his dedication to fitness in light of his nickname, the Rockhampton Rocket. This nickname was given to him by the legendary coach, Harry Hopman because he believed Rod (a junior at the time) was slow in his movements around the court. Whilst Rod threw aside the shackles of being slow around the court, his nickname lives on to this day!

SIGNIFICANCE OF ROD'S FIRST COACH

Throughout Rod's book there are many references to his first coach Charlie Hollis who coached him from age 10 to 14 years. Unquestionably Rod had enormous admiration and respect for Hollis acknowledging,

"If Charlie's and my paths hadn't met I may never have become an elite tennis player ... Without Charlie I don't know how my career would have turned out ... my career might not have happened at all" (p.12-13).

One well may ask, what was the secret to Hollis's influence? How did he shape Rod to have, as described by Roger Federer, an all-round game, incomparable court coverage, steely determination, incredibly strong under pressure, outstanding sportsmanship and an ability to bring his best game to the big stage (a Grand Slam or Davis Cup final)?

Rod provides the reader with examples of Hollis's approach and techniques that may help unravel the secret of Hollis's influence. These include:

- 'Stickler for correct form' - Hollis wanted Rod to be able to play every shot and put him through endless drills. Rod was required to hit every shot as perfectly as possible. To further consolidate good technique, Hollis had Rod 'shadow' play, pretending to hit imaginary balls (again as perfectly as possible).
- Embraced target hitting - Hollis placed tin cans just inside the baseline for Rod to aim his forehands and backhands. In a ritual to develop Rod's top-spin on his ground shots, Hollis would only conclude a session after Rod successfully hit 200 shots with top-spin. Adopting a similar technique to the tin cans, Hollis also marked areas around the court for Rod to aim his repertoire of shots. A more unusual technique adopted by Hollis, designed to improve Rod's serve, and save time collecting balls, was serving practice into a fence just two metres away from the player.
- Instilled the importance of 'heart, brains and a never-say-die fighting spirit' - Hollis believed these were the traits of good tennis players. He would share stories of great players with Rod to illustrate the significance of these traits. At every opportunity Hollis re-enforced the rewards to be gained by chasing down every ball, remaining positive, relishing the challenge of working hard, never giving up and learning from defeats. Hollis instilled in Rod, when things did not go his way, he had to knuckle down and play even more intensely. Importantly, it was not necessarily about winning; it was also about learning. Aided by his coach's holistic approach to teaching the game, Rod gained an understanding that *"tennis is as much a mental game as a physical one"* (p.104).
- Created opportunities to develop strategic powers - Hollis ensured Rod trained and played matches on clay, concrete and grass courts. This helped develop Rod's ability to adapt his game to changing circumstances, as did Hollis's advice to



'expect the unexpected' in a match, and indeed, for Rod to 'do the unexpected' to throw opponents off balance (e.g. get your opponent thinking you are going to do 'X' and then you do 'Y').

- Attended to physical fitness - Hollis stressed to Rod the importance of being fitter than opponents. Drawing on his own physical training in the military, Hollis would say, *"Just think Rodney, if you're tired, the other bloke will be exhausted"* (p.16). According to Hollis, physical fitness was essential if Rod was to chase down every ball and execute well. To this end, Hollis encouraged Rod to undertake rigorously extensive strength and conditioning work.
- Set standards - Drawing on the exemplary conduct of Jack Crawford (Australian champion of the 1930's), Hollis emphasised good sportsmanship, manners and general demeanour both on- and off-the court. *"You have to know how to act the part"* (p.19). In many ways this was easy for Hollis to impart, given he was an outstanding role model for the qualities he intended Rod to embrace.
- Unwavering belief in Rod - Hollis had a keen eye for talent, conveying this to Rod's father shortly after seeing 10 year old Rod hit on a court barefoot in his pyjamas. Such was Hollis's belief he coached Rod without charging any fees and briefed the legendary coach Harry Hopman, who went on to work with Rod. Hollis's belief in his player did not go unnoticed with Rod later acknowledging, *"Charlie Hollis made me believe that if I continued to apply myself I could be a champion tennis player"* (p.19).

'TAKE-HOME' MESSAGES FOR COACHES

Coaches will see different 'take-home' messages from Rod's accounts of his own game and the role of his first coach, Charlie Hollis. Unquestionably Rod's stature in the game was largely shaped by Hollis. Although Hollis only 'officially' coached Rod for four years, his teachings about the game and life were enduring. Accordingly, 'take-home' messages might be that successful coaching requires a coach to have many attributes and capabilities. Greatest in tennis is not a chance event. Rather, coaches can create and develop opportunities for players, leading by example at all times and equipping players with belief, skills and support to be the best they can. Not only is Rod Laver a legend, so too is Charlie Hollis.

REFERENCE

Laver, R. & Writer, L. (2013). Rod Laver: A memoir. Macmillan.

[RECOMMENDED ITF TENNIS ACADEMY CONTENT \(CLICK BELOW\)](#)



Designing an upper body resistance training program using closed kinetic chain exercises

[Britt Chandler \(USA\)](#)

ITF Coaching and Sport Science Review 2020; 82 (28): 19-21

ABSTRACT

The purpose of this article is to summarize research on the effects of CKC and OKC upper body resistance training on serve velocity. Practical applications of this research are discussed and examples of how these exercises can be implemented into a tennis player's training program are provided.

Key words: Bodyweight training, Serve velocity, Suspension training.

Corresponding author: scjmanagingeditor@gmail.com

Article received: 10 Jun 2020

Article accepted: 16 Sep 2020

INTRODUCTION

Tennis players are always looking to increase the velocity of the ball coming off their racket. In particular, serve velocity is critical with higher ranked players exhibiting greater serve velocities than lower ranked players (Ulbricht, Fernandez-Fernandez et al. 2016). One of the primary methods used to increase ball velocity is through resistance training. Various training methods such as free weight resistance training (Kraemer, Hakkinen et al. 2003, Fernandez-Fernandez, Ellenbecker et al. 2013), plyometric training (Behringer, Neuerburg et al. 2013, Fernandez-Fernandez, Villarreal et al. 2016) and elastic band training (Treiber, Lott et al. 1998, Fernandez-Fernandez, Ellenbecker et al. 2013) have shown small to moderate increases in serve velocity. The majority of these studies have focused on open kinetic chain (OKC) upper body resistance training. OKC exercises have a fixed body position and a terminal segment which moves throughout the exercise such as a bench press, lat pull down, or knee extension. OKC exercises are dependent on an external load or machine to provide resistance. In contrast, closed kinetic chain (CKC) exercises have a fixed terminal segment and the body moves during the exercise such as a push-up, pull-up or squat. CKC exercises are usually weight-bearing and use the exerciser's own body weight as resistance but may use an external load in addition to their bodyweight. Likely due to the ease of increasing load with OKC exercises, they are often preferred in upper body resistance training.

COMPARISON OF CLOSED AND OPEN KINETIC CHAIN RESISTANCE TRAINING

A recent study compared the effects of CKC and OKC upper body resistance training with equal loads on serve velocity in junior tennis players (Chandler 2019). The results of this study demonstrated that both methods of training produced improvements in serve velocity ($p < .05$), with no significant difference between groups ($p > .05$). However, the CKC group did produce larger increases in serve velocity. The CKC group increased average serve velocity 4.0 mph while the OKC group increased 2.4 mph. Additionally, only the CKC training group produced improvements in upper body power ($p < .05$) which was measured by a one arm medicine ball shot put. Both training groups produced similar improvements in upper body strength ($p < .05$). These results suggest that both OKC and CKC upper body resistance training can be used to increase serve velocity as well as upper body strength in tennis players. CKC upper body resistance training may also provide some performance benefits compared to OKC training as seen by the greater improvement in upper body power and larger increase in serve velocity.



The improvement in upper body power and the potential increase in serve velocity observed in this study with CKC training may be a result of improved muscular stability. The serve is a total body movement that requires force to be generated from the ground and up through the kinetic chain (Kovacs and Ellenbecker 2011). Along each link in the kinetic chain force must be created as well as transferred from the previous links in the chain. For this reason, muscles must be both producers of force as well as stabilizers to produce an optimal serve. CKC upper body exercises appear to increase both core and shoulder stability (Calatayud, Borreani et al. 2014). Therefore, improved stability through CKC upper body training may lead to a reduced loss of force transferred throughout the kinetic chain and ultimately higher ball velocity.

PRACTICAL APPLICATIONS

There are several practical applications that coaches can take from this research. Since CKC upper body resistance training produced similar improvements in strength and serve velocity coaches can prescribe these exercises in the training programs of their players. These exercises can be used as alternatives to more traditional OKC exercises to increase variety and provide a new training stimulus. For example, bench press variations can be replaced with a variety of push-up variations and dumbbell or cable machine rows can be replaced by a bodyweight inverted row. Table 1 provides a list of OKC upper body exercises and biomechanically similar CKC exercises that can be substituted in place of the OKC exercise. OKC exercises can still be performed but CKC exercises can be cycled into the pool of exercises that can be performed. Additionally, when creating an annual training plan coaches may want to place a greater emphasis on CKC upper body exercises during phases of training when power is

a goal because of the improvement in power seen with these exercises. An upper body workout with a focus on CKC exercises is provided in Table 2.

Table 1. List of open kinetic chain exercises and their biomechanically comparable closed kinetic chain exercises.

Open Kinetic Chain Exercise	Closed Kinetic Chain Exercise
Bench Press	Push-up
Dumbbell Row	Inverted Row
Overhead Press	Pike Push-up
Lat Pull Down	Pull-up
Band Shoulder External Rotation	Suspension Trainer Shoulder External Rotation
Band Y's and T's	Suspension Trainer Y's and T's

Table 2. Upper body workout with an emphasis on CKC training.

Exercise	Sets x Reps
Dumbbell Push Press	3x5 each arm
Pull-Ups	3x5
Weighted Push-Up	3x10
Inverted Row	3x10
Plank w/ Shoulder Taps	3x12
Push-up Crawl	3x12

This information can also be useful for designing training programs when athletes are travelling. Tennis players spend a lot of time on the road at tournaments, especially at the higher levels of the sport. When players are away from home access to gyms and resistance training equipment may be limited. As a result, CKC upper body training may offer a practical advantage. A variety of CKC exercises require no external load and can be performed with only body weight and a suspension trainer. A suspension trainer is a common form of CKC upper body training that allows the athlete to easily increase or decrease the load (amount of bodyweight being lifted) by changing the position of their feet. Moving the feet closer to the anchor point increases the load and moving the feet farther away from the anchor point decreases the load. Coaches can prescribe CKC exercises during travel periods when facilities and equipment are not available knowing that their athletes can still improve strength and performance. Table 3 presents a sample CKC upper body workout using a suspension trainer that can be performed in the athlete's hotel room.

Table 3. Sample upper body CKC suspension trainer workout.

Exercise	Sets x Reps
Suspension Trainer Push-up	3x10
Suspension Trainer Row	3x10
Suspension Trainer Shoulder External Rotation	3x12
Suspension Trainer Y's and T's	3x12
Plank w/ Shoulder Taps	3x12
Push-up Crawl	3x12

CONCLUSION

In conclusion, CKC upper body resistance training can be used as an effective method of improving strength and tennis performance. Strength and conditioning professionals can prescribe CKC upper body exercises in place of or in combination with traditional OKC exercises.

ACKNOWLEDGEMENTS

This study was supported in part by a grant from the International Tennis Federation.

REFERENCES

- Behringer, M., S. Neuerburg, M. Matthews and J. Mester (2013). "Effects of Two Different Resistance-Training Programs on Mean Tennis-Serve Velocity in Adolescents." *Pediatric Exercise Science* 25(3): 370-384.
- Calatayud, J., S. Borreani, J. C. Colado, F. Martin and M. Rogers (2014). "Muscle Activity Levels in Upper-Body Push Exercises with Different Loads and Stability Conditions." *The Physician and Sports Medicine* 42(4): 106-119.
- Chandler, W. B. (2019). *The Effects of Closed Kinetic Chain versus Open Kinetic Chain Upper Body Resistance Training on Serve Velocity in Junior Tennis Players*, Rocky Mountain University of Health Professions, Provo, UT.
- Fernandez-Fernandez, J., T. Ellenbecker, D. Sanz-Rivas, A. Ulbricht and A. Ferrautia (2013). "Effects of a 6-week Junior Tennis Conditioning Program on Service Velocity." *Journal of Sports Science & Medicine* 12(2): 232-239.
- Fernandez-Fernandez, J., E. S. D. Villarreal, D. Sanz-Rivas and M. Moya (2016). "The Effects of 8-Week Plyometric Training on Physical Performance in Young Tennis Players." *Pediatric Exercise Science* 28(1): 77-86.
- Kovacs, M. and T. Ellenbecker (2011). "An 8-Stage Model for Evaluating the Tennis Serve: Implications for Performance Enhancement and Injury Prevention." *Sports Health* 3(6): 504-513.
- Kraemer, W. J., K. Hakkinen, N. T. Triplett-Mcbride, A. C. Fry, L. P. Koziris, N. A. Ratamess, J. E. Bauer, J. S. Volek, T. McConnell, R. U. Newton, S. E. Gordon, D. Cummings, J. Hauth, F. Pullo, J. M. Lynch, S. J. Fleck, S. A. Mazzetti and H. G. Knuttgen (2003). "Physiological Changes with Periodized Resistance Training in Women Tennis Players." *Medicine and Science in Sports and Exercise* 35(1): 157-168.
- Treiber, F. A., J. Lott, J. Duncan, G. Slavens and H. Davis (1998). "Effects of Theraband and lightweight dumbbell training on shoulder rotation torque and serve performance in college tennis players." *The American Journal of Sports Medicine* 26(4): 510-515.
- Ulbricht, A., J. Fernandez-Fernandez, A. Mendez-Villanueva and A. Ferrauti (2016). "Impact of Fitness Characteristics on Tennis Performance in Elite Junior Tennis Players." *The Journal of Strength & Conditioning Research* 30(4): 989-998.

[RECOMMENDED ITF TENNIS ACADEMY CONTENT \(CLICK BELOW\)](#)



Bibliometrics of ITF Coaching & Sport Science Review

Duane Knudson (USA)

ITF Coaching and Sport Science Review 2020; 82 (28): 21-23

ABSTRACT

This study documented the citation metrics of articles published by the ITF Coaching & Sport Science Review (ITFCSSR) and indexed in Google Scholar (GS). A systematic searching of GS returned 209 unique ITFCSSR indexed articles published between 1993 and 2019 with 1139 citations. ITFCSSR articles had relatively low citation rates that confirmed previous bibliometric research on the gradual development of tennis knowledge compared to faster moving biomedical fields. ITFCSSR articles may make unique contributions to knowledge development in tennis science, particularly in coaching, physiology, and analytics/tactics.

Key words: Citation, index, infometrics, knowledge, scientometrics.

Corresponding author: dknudson@txstate.edu

Article received: 20 Sep 2020

Article accepted: 25 Oct 2020

INTRODUCTION

Tennis is a popular sport world-wide so there is considerable scientific interest in the sport. Research on tennis is published in a wide variety of disciplines on many sport-specific topics (Knudson, 2012; Knudson & Myers, 2021). There are also specialized journals in tennis science including the Journal of Medicine & Science in Tennis (JMST) and the ITF Coaching & Sport Science Review (ITFCSSR).

Previous tennis bibliometrics studies of tennis research has focused on highly cited articles (Knudson, 2012), ten years of Chinese research (Yuhan, 2016), and contributions from articles published in the Journal of Medicine & Science in Tennis (Knudson & Myers, 2020). Overall, these studies indicate stable knowledge production in tennis knowledge that may progress at a slower pace than other exercise or biomedical sciences based on citation rate to articles (Knudson & Myers, 2020).

In 2020, the ITFCSSR marked its 28th year with over 80 issues published in several languages. Research published in ITFCSSR contributes to tennis scientific knowledge and application of that knowledge for athletes, coaches, and sports professionals. Crespo and Over (2010) reported a content analysis the first 17 years (50 issues) of ITFCSSR and noted most articles were on psychology, coaching, and conditioning. Expansion of this initial content research to a complete bibliometric analysis of ITFCSSR could extend our understanding of knowledge development in tennis and document the unique contributions of this journal. The purpose of this study was to document the bibliometrics of articles published by the ITFCSSR and indexed in Google Scholar (GS).

METHOD

Systematic searches of the articles published by the ITFCSSR (ISSN 1812-2302 and 2225-4757) that were indexed by GS were conducted. GS provides the largest academic search engine of scholarly publications and their citations in journals, edited books, and patents. GS is also most relevant to searching for citations to ITFCSSR articles given the major subscription bibliometric databases (Scopus or Web of Science) do not index articles from the journal and are therefore provide a misleading and biased perspective on the articles published by the journal. GS indexes an estimated over 40,000 scholarly publications (Delgado-Lopez-Cozar & Cabezas-Clavjo, 2013) at least 2 to 4 times larger than most major bibliometric databases.

The search of GS was conducted using the following strategy. Records of searches of nine variations of the name of the journal (including common wording errors) were collected. These searches and the number of returned results were:

"coaching and sport science review"	151
"coaching and sports science review"	10
"coaching and sport sciences review"	0
"ITF coaching and sport science review"	124
"ITF coaching & sport science review"	36
"ITF coaching & sport sciences review"	0
"ITF coaching & sports science review"	5
"ITF coaching and sports sciences review"	0
"ITF coaches"	81
"ITF coaches review"	37

These results were reviewed and cleaned by examination of the title, abstracts, and if necessary, text of the articles. Duplicate records were combined and records to other publications (proceedings, books, chapters) removed. Following clean up there were 209 articles available for analysis as of July 30, 2020.

Two research usage/impact variables were collected from GS and one study variable was extracted from the articles. The usage variables were GS citations (C) to the articles and their citation rate [$CR = C/(2020 - \text{year published})$]. The study variable was the primary topic or main independent variable of each article. Article topic was classified into one of nine categories: Analytics/tactics, biomechanics/technique, coaching/teaching, equipment, nutrition, physiology/training, psychology/perceptual-motor, sports medicine/injury, or other (Knudson & Myers, 2020). A previous study reported the reliability of classification of study topics was 80 to 85% agreement between two investigators. Descriptive statistical analysis of the data were performed with JMP Pro 14 (SAS Institute, Cary, NC). Data were qualitatively compared to previous research and the journal's list of articles from the first 79 issues posted on the International Tennis Federation website (ITF, 2020).

RESULTS

A total of 209 unique ITFCSSR articles were indexed in GS. This represented 25% of the 846 articles published by the journal between 1993 and 2019 (ITF, 2020). The indexed articles were cited 1142 times according to GS. The distribution of citations to these articles was positively skewed ($\gamma = 2.8$) so descriptive statistics reported in Table 1 include the median and 25th and 75th percentiles (interquartile range). Typical SR to indexed ITFCSSR articles were between 0.28 and 0.44 citations/year (Table 1).

Table 1. Impact/usage of articles published in *ITFCSSR* and indexed in Google Scholar

Variable	Mean	SD	25th	Median	75th
Citation Citations	5.5	5.6	2.0	4.0	6.0
Citation Rate	0.44	0.46	0.15	0.28	0.58

Note: Citation Rate = $C/(2020\text{-year published})$

The most common topics of indexed *ITFCSSR* articles were in coaching/teaching (44%), analytics/tactics (14%), and physiology/training (12%) with others having smaller percentages (Figure 1). There was no apparent trend in primary topics of indexed *ITFCSSR* articles over the years, although coaching articles were more common early on when the journal was titled *ITF Coaches Review* (Figure 2).

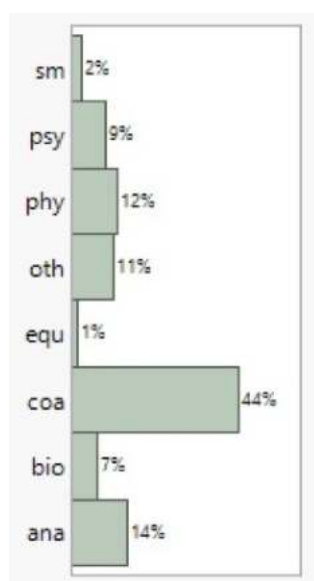


Figure 1. Distribution of primary article topics for *ITFCSSR* articles indexed in Google Scholar. ($n = 209$).



Figure 2. Distribution of primary topics of *ITFCSSR* articles indexed in GS by year of publication. Primary topics categories were: Analytics/tactics (ana), biomechanics/technique (bio), coaching/teaching (coa), equipment (equ), nutrition (nut), physiology/training (phy), psychology/perceptual-motor (psy), sports medicine/injury (sm), or other (oth).

DISCUSSION

Articles published in all of the first 79 issues (1993 until 2019) of *ITFCSSR* were indexed in GS. No articles for 2020 issues were indexed given the limited time for the work to be cited.. Five to 13 articles per year were typically indexed between 2000 and 2016, with fewer articles in the first eight, and fewer the last three volumes due to reduced time for citation (Figure 2-histogram bar height represent numbers of records).

The majority (95%) of the indexed articles were cited in subsequent tennis scientific research indexed by GS, although the indexed articles represented only 25% of all the articles published by the journal. The typical CR to these articles was low and about one citation over two years (Table 1). This agrees with the low CR reported for the *JMST* (Knudson & Myers, 2020) and most small, specialized scientific fields (Postma, 2007). CR to articles from *ITFCSSR* and *JMST* indicate that tennis scientific knowledge may advance slower than many biomedical and exercise science fields (Owlia, Vasei, Goliaei, & Nassiri, 2011; Knudson, 2014). Few (2-6%) indexed articles in *ITFCSSR* and *JMST* had high citation rates (> 2 C/year), however this is consistent with the results reported for even all the top cited articles in tennis science indexed in GS (Knudson, 2012).

ITFCSSR articles indexed in GS made broad contributions to tennis knowledge and were particularly strong in analytics, coaching, and physiology studies. The distribution of primary topics of indexed *ITFCSSR* articles (Figure 2) generally followed the distribution of article topics as identified by the journal itself (Figure 3), although the journal uses different categories. The most common topics identified by the journal were 22% (combination of coaching and teaching), miscellaneous (16%), psychology (12%), and conditioning (11%). Only 7% of articles *ITFCSSR* classified as tactics, however a higher percentage of the indexed and cited articles (14%) were classified in the current study as analytics/tactics.

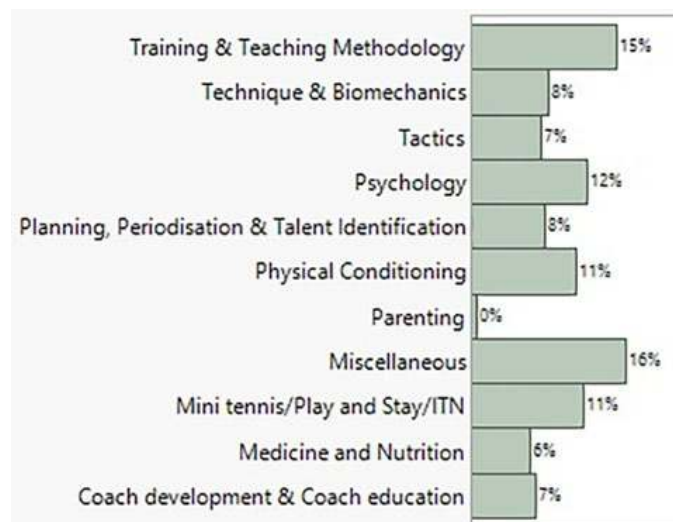


Figure 3. Distribution of topics of all 1993 to 2019 *ITFCSSR* articles according to the journal (ITF, 2020).

ITFCSSR had more articles (209) than the *JMST* (101) indexed in GS. The greater coverage (44%) of coaching/teaching by *ITFCSSR* is a strength of the journal that compliments the lower coverage (8%) of this topic by *JMST*. *ITFCSSR* also had many indexed articles on tennis analytics and physiology (Figure 1). Similar to a recent report on *JMST* indexed articles in GS (Knudson & Myers, 2020), the distribution of topics of *ITFCSSR* indexed articles did not appear to change over time (Figure 2). *JMST*, however, had qualitatively higher percentages of articles in sports medicine (13%) than *ITFCSSR* (2%). The current results also indicate a potential need for more tennis research in the area of nutrition (0%) and equipment. Only 1% of indexed articles in *ITFCSSR* and

5% in *JMST* were on equipment (balls, courts, rackets, shoes) even though it has a significant influence on players and the sport.

The limitations of the study were related to the subjectivity of the *GS* academic search engine, manual counting, cleaning, and classification of the results. *GS* has been criticized for lack of control of publications monitored, lack of time-control, limited full text access, and search control features (Schultz, 2007; Falagas, Pitsouni, & Malietzis, 2008). This search engine, however, has better coverage than publisher-driven, subscription databases (Walters, 2009). The major bibliometric databases like Scopus and Web of Science are biased against small, specialized journals they do not index. The labor-intensive and subjective process of cleaning errors in *GS* records, however, is also a limitation of all bibliometric database research (Knudson, 2019). The consistency of several results of this study with previous studies of *GS* records in tennis science (Knudson, 2012; Knudson & Myers, 2020), however indicate these limitations do not seriously affect the accuracy of the data or the inferences made.

CONCLUSION

It was concluded that *ITFCSSR* articles indexed in *GS* had relatively low citation rates that confirmed previous bibliometric research on the gradual development of tennis scientific knowledge compared to faster moving biomedical fields. *ITFCSSR* articles may make unique contributions to knowledge development in tennis, particularly in coaching, physiology, and analytics/tactics.

Disclosure: In accordance with my ethical obligation as a researcher, I have previously published in the journal under study that may be affected by the research in this report.

REFERENCES

- Crespo, M., & Over, S. (2010). ITF Coaching and Sport Science Review: A analysis of 17 years—50 issues. *ITF Coaching and Sport Science Review*, 50(18) 32-33.
- Delgado-Lopez-Cozar, E. & Cabezas-Clavjo, A. (2013). Ranking journals: Could google scholar metrics be an alternative to journal citation reports and scimago journal rank? *Learned Publishing*, 26, 101–114.
- Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). *FASEB Journal*, 22, 338-342.
- ITF (2020). ITF CSSR Article List Full. <https://www.itf-academy.com/?view=itfview&academy=103&itemid=1168>
- Knudson, D. (2012). Citation classics in tennis medicine and science. *Journal of Medicine & Science in Tennis*, 17, 118-122.
- Knudson, D. (2019). Judicious use of bibliometrics to supplement peer evaluations of research in kinesiology. *Kinesiology Review*, 8, 100-109.
- Knudson, D., & Myers, N. L. (2020). A bibliometric analysis of the *Journal of Medicine & Science in Tennis*. *Journal of Medicine & Science in Tennis*, Article in review.
- Postma, E. (2007). Inflated impact factors? The true impact of evolutionary papers in non-evolutionary journals. *PLoS One*, 2(10), e999. doi:10.1371/journal.pone.0000999
- Schultz, M. (2007). Comparing test searchers in PubMed and Google Scholar. *Journal of the Medical Library Association*, 95, 442-445.
- Velasco, J. V., & Garcia, J. P. F. (2015). Review of sport science research specialized on wheelchair tennis. *ITF Coaching & Sport Science Review*, 65(23), 14-15.
- Walters, W. H. (2009). Google scholar search performance: Comparative recall and precision. *Libraries and the Academy*, 9, 5-24.
- Yuhuan, L. (2016). Bibliometric analysis of the sport core periodicals scientific literature of tennis research in recent ten years. *Contemporary Sports Technology*, 14, 159-160.

RECOMMENDED ITF TENNIS ACADEMY CONTENT (CLICK BELOW)



PETF performance indicator: An analysis of current tactical trends in women's tennis

Enrico Serfotis (BRA)

ITF Coaching and Sport Science Review 2020; 82 (28): 24-26

ABSTRACT

Many studies have focused on isolated tactical characteristics of tennis and have given less importance to the female game. The goal of this article was to create, based on the existing literature and the observation on the women's game, the PETF indicator (Pattern success of women 's tennis), which tries to gather the most important tactical needs of the women's game, and to validate them through questionnaires answered by active players from the WTA circuit and ITF World Tour, seeking to achieve a consensus on the key aspects and analyse their tactical knowledge.

Key words: Tactical, female, training, PETF.

Corresponding author: enrivasco@hotmail.com

Article received: 20 Jul 2020

Article accepted: 20 Sep 2020

INTRODUCTION

Advances in sports technology and science have helped female players to be increasingly faster and stronger. However, this does not mean that just the power of the shot is a factor that determines the success in the women's game. Nowadays, aggressive groundstrokes are an integral and essential part of a good player and should be the basis of their tactical pattern, but the use of high bouncing shots, drop shots and approaches to the net cannot be forgotten (Antoun, 2007). And despite sharing these and other characteristics with men's tennis, we know that women's tennis has its peculiarities. Besides highlighting the relevance of the style of play and the tactical patterns, it is important to know how these are created and developed. The need to promote this development from an early age is extremely essential so that, over time, trained patterns of play become habits, trust is established and a personal style is defined. Any pattern of play desired to be mastered in later ages must be worked on in early periods, due to the fact that with just the variation it is not enough. The female game is progressing through a period in which the variation of game plays and patterns has been gaining a considerable importance. However, did that importance come to stay? Or will it be solved with more and more power to the point that they will become less frequent again?

PETF

The PETF indicator was created to highlight and establish criteria for a possible optimal tactical pattern of performance in the women's game. Below are the 11 tactical factors that make up the PETF:

- Stances and aggressive shots
- Serve + 1st aggressive shot
- Serve: power, direction and spin
- Aggressive return near the baseline
- Opening angles with the groundstrokes
- Taking the initiative: by power and variation of rhythm, time and spin
- Powerful change of direction
- Dominate and play with the zones of the court
- Mastering the baseline - net zone transition
- Gain ground and seek to impact the ball on the rise
- Know how to finish off the point from both sides

METHODOLOGY

The study sought to tactically evaluate professional female players by a questionnaire that had 11 questions, 9 discursive and 2 objective. Most of the questions were as open as possible to check if their answers matched the criteria proposed by the indicator and to analyse their tactical knowledge, therefore, there was no criteria limit to answer them, and the analysis was based on a general trend. The sample was composed by 13 answered questionnaires, 12 of them from WTA ranked players, and one with ITF World Tour ranking. Four countries were represented as follows: 6 Brazilian, 5 Spanish, 1 Mexican and 1 Argentine. The WTA and ITF rankings World Tour of the players ranged 261 and 956 WTA, and 834 of the ITF World Tour. Of the 13 players two were left-handed and the other 11 were right-handed.

Table 1. Questions 1 to 11 of the questionnaire.

1	Mention the 5 more important tactical factors of the women's game in your opinion
2	Usually, how is your tactical pattern when serving?
3	Usually, how is your tactical pattern when receiving?
4	Which was the relevance of tactics when you were a young player and how was it developed?
5	Which are the changes you make in your game depending on the court surface?
6	Do you think that powerfully changing the direction of the shot is a key aspect of the women's game?
7	Do you think that a good and quick transition from defensive to offensive situations is a key aspect of the women's game?
8	According to your characteristics, how do you value the use of the baseline to net transition?
9	According to your characteristics, how do you value the use of the variations?
10	During a point, do you generally look to finish it off with both sides or do you preferably use more one side than the other? If possible, justify your answer
11	Indicate if you reflect about the main tactical characteristics of the women's game nowadays

RESULTS

A considerable uniformity was found in the 13 completed questionnaires: However, some of the players answered thinking in a strategic mindset about how to establish their plans, while others focused more on tactical solutions that they use more often. The first and last questions were asked on purpose to check whether the answer to the questions matched with what they found determinant for the success of the women's game

and they were the questions more open of the questionnaire. Questions from 2 to 5 and from 8 to 10 were also discursive, but dealt about a specific type of play. Questions 6 and 7 were objective and only an option could be chosen. Table 2 shows the answers to each question in decreasing order and the criteria that achieved the same number of votes in the same line. Figure 1 shows the percentage of objective questions.

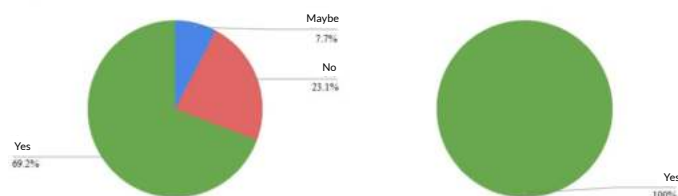


Table 2. Answers from the questions.

Question 1	Question 8
Open the court / Solid game patterns /	Impression of trying to go for it: 12 votes
Reading and decision making / Variations: 6 votes	Taking advantage of short balls: 7 votes
How to play in important points: 4 votes	When has perceived that the court is open: 4 votes
Have a plan A and B / change directions / Opponent's weaknesses / Reduce the time / Approach the net: 3 votes	Perceived the importance and now it is used more: 3 votes
Know your weapons / Margin: 2 votes	Know the importance and acknowledges that should use it more: 1 vote
Down the line backhand / 1st serve percentage / good 1st shot / volume / inside out forehand / return inside of the court: 1 vote	Question 9
Question 2	Used and it is key to vary: 10 votes
Take the initiative with serve + 1st shot (variation and opening the court): 10 votes	Used but not specified: 7 votes
1st serve percentage: 3 votes	Mentioned effect: 4 votes
Serve to avoid the opponent to have space: 1 vote	Mentioned rhythm: 4 votes
Depending on the opponent's strengths: 1 vote	Mentioned height: 4 votes
Question 3	Does not use but recognised its importance: 1 vote
Open the court with the 2nd serve aggressively: 10 points	Question 10
Hitting hard with margin: 7 votes	Preferably forehand: 9 votes
Question 4	Comfortable with both: 8 votes
No relevant in the development (after maturation): 8 votes	Preferably backhand: 3 votes
From early stages but without specification: 5 votes	Question 11
Question 5	Approaching the net / aggressive / variation: 4 votes
Building the point: 9 votes	Versatility / serve: 3 votes
Reducing the time: 6 votes	Mobility / changing directions: 2 votes
Trajectories and effects: 5 votes	Keep the pattern / order / confidence / solid: 1 vote
Mobility: 4 votes	Have a plan A and B / return / choices / angles: 1 vote
Down the line changes: 1 vote	Effectiveness in the two first balls / volume / defence: 1 vote
Adapting the backswing: 1 vote	
Serving depending on the conditions: 1 vote	
Check the type of ball: 1 vote	

DISCUSSION

The answers of the players initially allow to think of two aspects: first, if their perceptions match to that established in the PETF and they are in the right path; second, if they do not correspond with the PETF which implies that they need to adapt to it, or that they are on the right track and there are more important things not included in this context. It is important to emphasise that the purpose of this study was not trying to achieve that all players play always the same, in fact, it has been the opposite. Once identified the relevance of individually considering on all these aspects included in the PETF, both the coach and the player should decide how to work them during practice and use them during match play depending on the set goals. However, it is necessary that all tactical aspects that are defined both inside and outside of the PETF should be worked from the formative phases using, among other tools, the concepts of tactical periodization (Crespo, 2011). This is due to the fact that the majority of the players that answered this questionnaire mentioned that they started their tactical training after their maturation, which is already a late stage.

No player answered the questions so that a defensive behaviour could be understood, on the contrary. All respondents agreed in that they take the initiative, attack and worked the point with an attacking sequence of shots, which is in line with Martinez-Gallego et al. (2013; 2018). In addition to that being very positive, a factor already mentioned by Van Aken (2002) is that using a defensive style of play is outdated, aspect that it is true in today's women's elite game. Therefore, it should be remembered that being successful at winning the point is not a matter of power, but in a rally of powerful groundstrokes, variation may be the solution. This attacking pattern was also evident in service and return situations. In this case it is important to emphasise that, although women have less ability to produce powerful strokes than men, they have the potential to develop a powerful service if it is trained at younger ages. In addition, almost all players recognised the importance of variation in the serve and groundstroke game situations, both in the open questions and the specific one. Therefore, power and variation have a fundamental role. It seems that there is no one better than the other, but that they should be efficiently used depending on the game pattern and style of the player (Rodríguez, 2012).

The return of serve is an issue frequently discussed in women's tennis. Its importance is justified due to the fact that female players do not serve as hard and with the same effect as their male counterparts. However, it is true that these characteristics of the serve are more evident in the female game due to the general lack of relevance given to the serve in the development phases. Furthermore, according to Sanchez-Alcaraz Martínez et al. (2018) in the return of serve game situation women win more points than men. Therefore, the return of serve is still a very important game situation in the women's game. However, even though players in the sample did not make any specific comments in the open questions, they could have included it within some of the mentioned features. A positive aspect is that, in the specific question about the game patterns with the return of serve, the majority of the players agreed in that they had an attacking behaviour and liked to take the initiative.

Taking the initiative was mentioned in all answers from the players with great emphasis. This characteristic was identified as a priority for their game together with building the point more on slow courts, opening the court, being aggressive and using variety. These priorities are indicated according to the responses to the factual questions which again showed the intention of being aggressive, the importance of gaining space moving forward and the search for remaining in the offensive zones of the court. An interesting aspect is that players indicated that they hit flatter shots when changing directions and, due to the fact that they have less muscular power than men, a good option to take advantage of the offensive zones of the court and moving to the net could be the reduction of the time by performing a more lineal stroke movement.

Closing points at the net is a game pattern that cannot be forgotten in women's tennis. Players answered that they recognised its importance and that they tried to use this pattern. Therefore, the essential aspect is that this is a habitual game play in which players have confidence in.

On another side, the importance of the backhand in the female game is also discussed, but most of the players indicated that they preferred to dominate and finish the point with their forehands. In this scenario, it seems necessary to reflect if the forehand is really more important than the backhand in the women's game or if the training of the female players is similar to those of their male counterparts.

CONCLUSIONS

The tactics of the women's game has its peculiarities and needs a specific training system. All the criteria included in the indicator used in this article should be trained with the female players in a tactical development mentality from the formative phases, and should continue to be worked at the professional stage. The baseline-to-net transition was recognised as important by all the players. All of them mentioned that in all of their patterns of play they tried to play offensively and seeking always to take the initiative. Variations were considered important within a game pattern based on an attacking mentality. Therefore, it is necessary to continue observing the different tactical behaviours to evaluate and understand what really happens in the women's professional game.

REFERENCES

- Antoun, R (2007). Using variety from the baseline in women's tennis. *ITF Coaching Sports Science Review* 43, 2-3
- Courel-Ibañez, J., García Cambronero, S., Sanchez-Alcaraz Martínez, JB, Sanchez-Pay, A. (2018). Differences in service and return in top 8 men and women ranking. *ITF Coaching & Sport Science Review*, 76, 12-13.
- Crespo, M. (2011). Tactical periodization in tennis: An introduction, *ITF Coaching & Sport Science Review*, 53, 16-18.
- Martínez-Gallego, R., Guzmán, J. F., James, N., Pers, J., Ramón-Llin, J., & Vuckovic, G. (2013). Movement characteristics of elite tennis players on hard courts with respect to the direction of ground strokes. *Journal of sports science & medicine*, 12(2), 275.
- Martínez-Gallego, R. (2018). Tactical analysis in tennis: From its origins to the present, *ITF Coaching & Sport Science Review*, 74, 23-24.
- Rodríguez, C. (2012). Women's tennis: Past, present and future, *ITF Coaching & Sport Science Review*, 56, 20-22.
- Van Aken, I. (2002). Tactics Specific to the female game, *ITF Coaching & Sport Science Review*, 27, 13-14.

[RECOMMENDED ITF TENNIS ACADEMY CONTENT \(CLICK BELOW\)](#)



Proposal of a specific test in tennis: Test of shot speed and precision

Manuel Alfonso-Asencio, Marta Hellín-Martínez &
Bernardino J. Sánchez-Alcaraz (ESP)

ITF Coaching and Sport Science Review 2020; 82 (28): 27-29

ABSTRACT

Tennis is a sport in which various variables related to performance influence the final result of a match. The speed and precision of the shots are among the most decisive of them. The objective of this study was to develop a test to assess the performance in terms of the speed and the precision of the forehand, backhand and serve of tennis players. The sample consisted of 4 amateur players. The analysis of the data obtained in the test provides the coach with information about the level of performance of the players and their progression.

Key words: tennis, performance, speed, precision.

Corresponding author: alfonso_manase@gva.es

Article received: 18 May 2020

Article accepted: 20 Jun 2020

INTRODUCTION

Tennis is a sport that is characterised by a great variety of strokes, among which, due to its greater frequency, the serve, the forehand and the backhand stand out (Baiget, Iglesias, Vallejo, and Rodríguez, 2011; Kovalchik and Reid, 2017). Tennis competition demands from players a high degree of technical precision in stroke production, being a fundamental component to achieve good performance (Haake, Chadwick, Dignall, Goodwill and Rose 2001; Menayo, Fuentes, Moreno, Clemente and García, 2008). Different studies have shown a direct relationship between technical ability (measured through the level of precision and speed of the shots) and the competitive level of the tennis player (Kovacs, 2007; Reid, Crespo, Lay and Berry, 2007; Urbán, Hernández-Davó and Moreno, 2012).

With the aim of understanding the technical ability of the players, the literature has proposed a wide variety of tests to evaluate the precision and speed of tennis shots in different game situations, considering parameters of shot resistance and performance (Ferrauti Kinner, and Fernández-Fernández, 2011; Lyons, Al- Nakeed, Hankey and Nevill, 2013; Vergauwen, Madou and Behets, 2004). These studies have allowed to design instruments for the evaluation of the player's technique, simulating the physical demands of tennis competition. These instruments are of special interest when designing specific tennis training sessions (Fernández-Fernández et al., 2012). Therefore, the objective of this study was to design a test to assess the performance in terms of speed and precision of the forehand, backhand and serve of tennis players.

METHODOLOGY

Participants

The study sample consisted of a total of 4 amateur junior tennis players with ages between 11 and 14 years (mean age 12.75 $\pm$ 1.50 years).

Protocol for the development of the test

The development of the test of speed and precision in tennis strokes is presented. This test evaluates the variables of speed and precision in the forehand, backhand and serve in prolonged playing situations. The design of the test has been based on similar previous research in tennis (Fernández-Fernández et al., 2012). Prior to the test, the players must perform a 5 minute general warm-up and a 10 minute specific warm-up (Alfonso-Asencio and Menayo, 2019).

The test procedure consists of conducting three blocks of exercises for each stroke (Figure 1). In block I the player performs forehands, in block II performs backhands, and in block III performs serves. The player rests 90 seconds between each block of exercises, and 20 seconds between each series of strokes. Before performing the test, the players should be instructed to try to achieve the highest speed in their strokes while maintaining precision. In addition, players should be instructed to recover to the centre of the court after each forehand and backhand hit.

Test of precision and speed of tennis shots			
Warm up	Block I. Forehand	Block II. Backhand	Block III. Serve
General warm up (5')	Serie 1. 6 crosscourt FHs	Serie 1. 6 crosscourt BHs	Right side
Joint mobility			
Movement	Serie 2. 6 crosscourt FHs	Serie 2. 6 crosscourt BHs	Serie 1. 10 wide serves
Jumps			
Specific warm up (10')	Serie 3. 6 crosscourt FHs	Serie 3. 6 crosscourt BHs	Serie 2. 10 wide serves
	Serie 4. 6 crosscourt FHs	Serie 4. 6 crosscourt BHs	Left side
	Serie 5. 6 crosscourt FHs	Serie 5. 6 crosscourt BHs	Serie 1. 10 "T" serves
FH & BH shadows			
FH & BH with movement			
Serves	Serie 6. 6 crosscourt FHs	Serie 6. 6 crosscourt BHs	Serie 2. 10 "T" serves

Figure 1. Development protocol of the speed and precision test of the forehand, backhand and serve in tennis.

The points of maximum precision for the shots are: i) forehand and backhand shots: intersection of the baseline and the singles line; ii) wide service: intersection of the singles line and the service line; iii) service to zone T: intersection of the line dividing the serve boxes and the service line.

Instruments

Speed: A radar with an accuracy of ± 1 km / h is used to record the output ball speed.

Accuracy: During the test, a video camera is used to record the bounce of the ball, at least at 240 fps.

Ball feeding: A ball machine is used to feed the balls to the blocks I and II with the same speed, precision, and frequency. Before carrying out the test, it is necessary to calibrate and verify the correct operation of the machine.

Instrument placement during the test

Block I - Forehand and Block II - Backhand

The radar is placed on a 1-metre high tripod behind the player, at a distance of 3 metres from the baseline, 2-metres from the singles line and directed towards the direction of the shots. This radar placement is used on both the left and right sides of the court. A coach or an assistant will be placed besides the radar to write down the ball speed of each shot on a log sheet. On the other hand, the video camera is placed on a tripod 1 metre from the extension of the singles line and 4.5 metres from the baseline. Finally, the ball machine is placed on the baseline and 2 metres from the singles line. Figure 2 shows the placement of the radar, the ball machine, the video camera and the directions of the shots during the test.

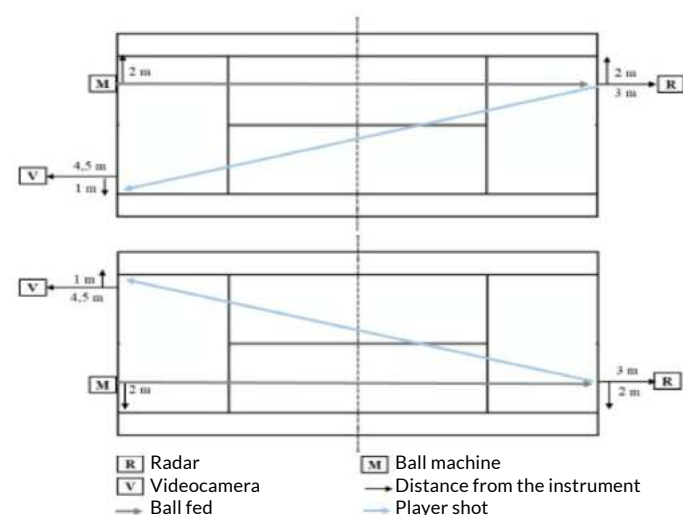


Figure 2. Position des instruments utilisés et directions des coups dans le bloc I - coup droit (court en bas) et le bloc II - revers (court en haut).

Block III - Service

In block III, the radar is placed on a tripod 2 metres high behind the player and at a distance 1.5 metres from the centre line and 3 metres from the baseline. To avoid measurement errors, the radar is oriented in the direction of the serves. On the other hand, the video camera is placed on a tripod at a height of 2 metres, above the baseline. When hitting wide serves, the player stands at the intersection of the baseline and singles line. When serving "T" serves, the player stands on the central service line. Figure 3 shows the placement of the radar, the video camera and the direction of the serves during the test.

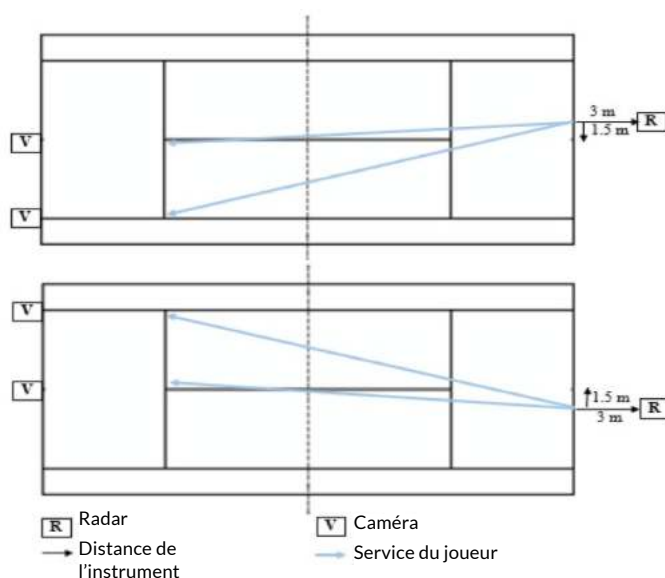


Figure 3. Position of the instruments used and the direction of serves in block III - service for the right side (court above) and for the left side (court below).

Analysis of the test data

Once the test was finalised, ball bounces were digitalised using the software Kinovea to later export data to a spreadsheet. The shot precision was determined by radial error (ER), measuring the distance from the ball bounce to the point of maximum precision. The formula used was the one proposed by Van den Tillar and Ettema (2003), specifically:

$$ER = \sqrt{(x-x')^2 + (y-y')^2}$$

Finally, the speed and precision data were transferred to a spreadsheet for statistical analysis.

RESULTS

Table 1 shows the results of ball speed and precision in the serve and backhand shots obtained by each player. It should be noted that the data related to the forehand will be analysed in future research.

Table 1. Descriptive results of the ball speed and precision obtained by each player in the serve and backhand shots.

Player	Serve Speed (km/h)	Precision (cm)	Backhand Speed (km/h)	Precision (cm)
1	116.4±6.1	238.0±161.1	73.5±5.8	481.0±229.2
2	121.3±10.2	225.1±66.0	69.2±5.5	368.7±152.8
3	142.5±13.3	249.1±269.4	71.7±8.2	385.1±176.27
4	118.5±7.8	242.4±96.5	71.6±6.9	449.5±175.4

CONCLUSIONS AND PRACTICAL APPLICATIONS

The objective of this test was to register the speed and precision of the forehand, backhand and serve shots in tennis through a simple protocol with inexpensive instruments. These variables are determinant in the player's performance (Menayo et al., 2008) and their progression, allowing to determine the suitability of the training programs developed. Finally, future studies are encouraged to implement this test to find out the speed and precision values of the players according to different variables such as age, gender or level of play.

REFERENCES

- Alfonso-Asencio, M., y Menayo, R. (2019). Induced variability during the tennis service practice affect the performance of every tennis player individually and specifically. *European Journal of Human Movement*, 43, 86-101.
- Fernández-Fernández, J., Sanz, D., Moya, M., González de la Aleja, J., Ávila, F., y Méndez-Villanueva, A. (2012). Propuesta de un test para evaluar a los jugadores de tenis ante situaciones de golpeo prolongadas y variadas: tennis hitting test. *Revista E-Coach*, 13, 1-8.
- Ferrauti, A., Kinner, V., y Fernández-Fernández, J. (2011). The Hit & Turn Tennis Test: An acoustically controlled endurance test for tennis players. *Journal of Sport Sciences*, 29(5), 485-494.
- Haake S.S., Chadwick, S.G., Dignall, R. J., Goodwill, S., y Rose P. (2000). Engineering tennis – slowing the game down. *Sports Engineering*, 3(2), 1-12.
- Kovacs, M.S. (2007). Tennis physiology: training the competitive athlete. *Sports Medicine*, 37(3), 189-198.
- Kovalchik, S. A., y Reid, M. (2017). Comparing Matchplay Characteristics and Physical Demands of Junior and Professional Tennis Athletes in the Era of Big Data. *Journal of Sports Science and Medicine*, 16, 489-497.
- Lyons, M., Al-Nakeeb, Y., Hankey, J., y Nevill, A. (2013). The effect of moderate and high-intensity fatigue on groundstroke accuracy in expert and non-expert tennis players. *Journal of Sports Science & Medicine*, 12(2), 298-308.
- Menayo, R., García, J.P.F., Hernández, F.J.M., Clemente, R., y Calvo, T.G. (2008). Relación entre la velocidad de la pelota y la precisión en el servicio plano en tenis en jugadores de perfeccionamiento. *European Journal of Human Movement*, 21, 17-30.
- Reid, M., Crespo, M., Lay, B., y Berry, J. (2007). Skill acquisition in tennis: research and current practice. *Journal of Science and Medicine in Sport*, 10(1), 1-10.
- Urbán, T.; Hernández-Davó, H., y Moreno, F.J. (2012). Variabilidad cinemática en relación con el rendimiento en el saque en jóvenes tenistas. *Motricidad. European Journal of Human Movement*, 29, 49-60.
- Van den Tillar, R., y Ettema, G. (2003). Instructions emphasizing, velocity, accuracy, or both in performance and kinematics of overarm throwing. *Perceptual Motor Skills*, 103, 503-514.
- Vergauwen, L., Madou, B., y Behets, D. (2004). Authentic evaluation of forehand groundstrokes in young low- to intermediate-level tennis players. *Medicine and Science in Sports and Exercise*, 36(12), 2099-2106.

RECOMMENDED ITF TENNIS ACADEMY CONTENT (CLICK BELOW)



Recommended e-books

ITF EBOOKS

ITF ebooks offers an exclusive range of publications from the world of tennis, which are a must read for all those with an interest in the sport.

In this app users will find manuals for training and development, regularly published scientific research articles from worldwide experts and key technical and tactical information.

Users can also download and read several free publications on their mobile device or purchase ebooks at a significant discount to the printed versions. This app provides publications in Spanish, English, French, Russian, Chinese, Portuguese and Arabic.

ITF ebooks



The image displays the ITF ebooks app interface and its availability on mobile devices. On the left, a white smartphone mockup shows the app icon among other standard iOS apps like Newsstand, iTunes Store, App Store, Passbook, Settings, Phone, Mail, Safari, and Music. Above the phone, the ITF ebooks logo is shown alongside the Android and Apple logos. To the right, a tablet mockup displays the app's library screen, which features a grid of book covers with titles such as 'Guide to Recommended Health Care', 'Rules of Tennis 2017', 'The Forehand Shot in Tennis', 'The Tennis Volunteer', 'Essential Readings for Your Tennis Coaches (vol. I)', and 'Being a Better Tennis Parent'. Each book cover includes a 'Free' or 'Info' button. The ITF logo and 'International Tennis Federation' text are visible at the top of the tablet screen.

Available to download on all Apple and Android mobile devices and tablets



ITF
International Tennis Federation

Recommended books

TÊNIS

um olhar multidisciplinar






"Tênis: um olhar multidisciplinar"

A busca por informação sempre é importante na vida do ser humano. Um livro voltado para a comunidade do tênis chega em boa hora. Professores do Brasil inteiro poderão através desse livro tirar algumas dúvidas em relação ao trabalho na formação do tenista. Necessidades que sempre buscamos na troca de informações com diversos treinadores.

Jaime Oncins
Capitão da Equipe Brasileira da Copa Davis

Caio Corrêa Cortela
Carlos Adelar Abaide Balbinotti
Janice Zarpellon Mazo
Juan Pedro Fuentes García
Organizadores





"Tênis: um olhar multidisciplinar"

Um livro que reúne vários temas importantes para o crescimento e aprimoramento do Tênis Brasileiro. Escrito por autores de grande conhecimento abordando inúmeras questões relacionadas ao Tênis, com várias dicas que elucidarão dúvidas das pessoas envolvidas no esporte. Traz um espectro amplo da modalidade pontuando aspectos múltiplos, que além dos professores e treinadores, desperta o interesse a todo tipo de leitor, desde um jogador iniciante até mesmo um tenista profissional. O livro chega em boa hora pois há muito tempo, a comunidade brasileira do Tênis em geral, ansiava por mais informações técnicas e de qualidade.

Roberta Burzagli
Capitã da Equipe Brasileira da Billie Jean King Cup

TÊNIS

um olhar multidisciplinar

Esta obra reúne estudiosos, pesquisadores e amantes do tênis que vem dedicando muitos anos de suas vidas para apresentar todos os ângulos possíveis do nosso esporte. Uma leitura obrigatória para todos aqueles que queiram entender e apreciar todas as riquezas deste esporte em seus mínimos detalhes.

Carlos Kirmayr
treinador, ex-tenista profissional
Ex-Capitão da Equipe Brasileira da Copa Davis

"Leitura extremamente interessante para quem quer evoluir. Livro cheio de informações e curiosidades. Fascinante".

Talliana Pereira
ex-tenista profissional

Este livro elaborado por grandes especialistas aborda aspectos de extrema importância para atletas, profissionais da área, e todos os amantes da bolinha amarela. A leitura é indispensável para aqueles que queiram entender o mundo do tênis desde o trabalho de base, que foi fundamental na minha formação, abrindo caminhos para que eu chegasse ao alto rendimento.

Beatriz Haddad Maia
tenista profissional

Devo boa % do meu sucesso na carreira a meus treinadores. Todos eles tiveram participação enorme no meu desenvolvimento. Contar com um treinador é algo importantíssimo e todo atleta tem a necessidade de bons educadores em suas carreiras. Como ex-atleta profissional e hoje pai de atletas, acredito que esse livro seja de uma relevância enorme para treinadores buscarem capacitação e também valorização de tudo que se busca no meio esportivo.

Alex
ex-jogador profissional de futebol



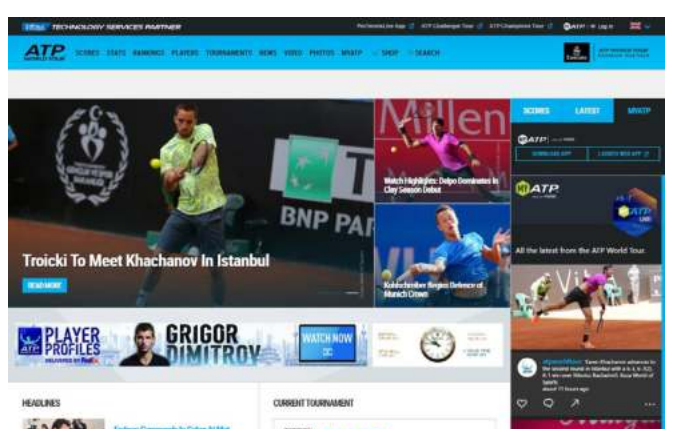
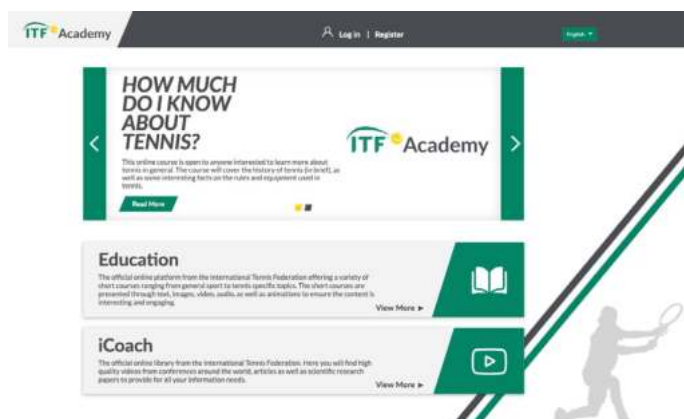
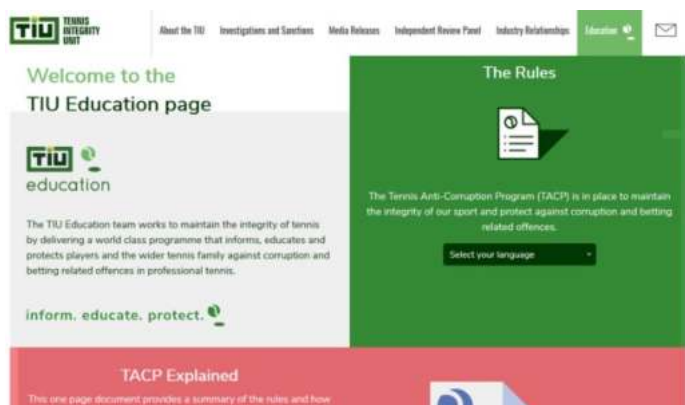




Qrcode

Barcode

Recommended web links



General guidelines for submitting articles to ITF Coaching & Sport Science Review

PUBLISHER

International Tennis Federation, Ltd.
Development and Coaching Department.
e-mail: coaching@itftennis.com

EDITORS

Miguel Crespo, PhD. and Luca Santilli

ASSOCIATE EDITORS

Javier Pérez, MSc. and Rafael Martinez, PhD.

EDITORIAL BOARD

Alexander Ferrauti, PhD. (Bochum University, Germany)
Andres Gómez (Federación Ecuatoriana de Tenis, Ecuador)
Ann Quinn, PhD. (Quinnesential Coaching, UK)
Anna Skorodumova PhD. (Institute of Physical Culture, Russia)
Babette Pluim, M.D. PhD. (Royal Dutch Tennis Association, The Netherlands)
Bernard Pestre (French Tennis Federation, France)
Boris Sobkin (Russian Tennis Federation, Russia)
Brian Hainline, M.D. (United States Tennis Association, USA)
Bruce Elliott, PhD. (University Western Australia, Australia)
David Sanz, PhD. (Real Federación Española de Tenis, Spain)
Debbie Kirkwood (Tennis Canada, Canada)
E. Paul Roetert, PhD. (AAHPERD, USA)
Hani Nasser (Egyptian Tennis Federation, Egypt)
Hans-Peter Born (German Tennis Federation, Germany)
Hemant Bendrey (All India Tennis Association, India)
Hichem Riani (Confederation of African Tennis, Tunisia)
Hyato Sakurai (Japan Tennis Association, Japan)
Janet Young, Ph.D. (Victoria University, Australia)
Kamil Patel (Mauritius Tennis Federation, Mauritius)
Karl Weber, M.D. (Cologne Sports University, Germany)
Kathleen Stroia (Womens Tennis Association, USA)
Louis Cayer (Lawn Tennis Association, UK)
Machar Reid, PhD. (Tennis Australia, Australia)
Paul Lubbers, PhD. (United States Tennis Association, USA)
Mark Kovacs, PhD. (Director, GSSI Barrington, USA)
Per Renstrom, PhD. (Association of Tennis Professionals, USA)
Stuart Miller, PhD. (International Tennis Federation, UK)

TOPICS & SCOPE

ITF Coaching and Sport Science Review considers for publication original research, review papers, opinion pieces, short reports, technical notes, topical lectures and letters in the disciplines of medicine, physiotherapy, anthropometry, biomechanics and technique, conditioning, methodology, management and marketing, motor performance, nutrition, psychology, physiology, sociology, statistics, tactics, training systems, and others, having specific and practical applications to tennis coaching. The intended readership of the publication is directed to all those involved in, and interested in coaching methodology and sport sciences relating to tennis.

PERIODICITY

ITF Coaching and Sport Science Review is published tri-annually in the months of April, August and December.

FORMAT

Articles should be word-processed preferably using Microsoft Word, but other Microsoft compatible formats are accepted. The length of the article should be no more than 1,500 words, with a maximum of 4 photographs to be attached. Manuscripts should be typed, double spaced with wide margins for A4-size paper. All pages should be numbered.

Papers should usually follow the conventional form: abstract, introduction, main part (methods and procedures, results, discussion / review of the literature, proposals-drills-exercises), conclusions and references. Diagrams should be done using Microsoft Power Point or any other Microsoft compatible software. Tables, figures and photos should be relevant to the paper and should have self explanatory captions. They should be inserted in the text. Papers should include between 5 and 15 references that should be included (author/s, year) where they occur in the text. At the end of the paper the whole reference should be listed alphabetically under the heading 'References' using the APA citation norms. Please refer to <http://www.apastyle.org/> for guidelines and tutorials. Headings should be typed in bold and upper case. Acknowledgement should be made of any research grant source. Up to four keywords should also be given and the corresponding author contact details.

STYLE AND LANGUAGES OF SUBMISSION

Clarity of expression should be an objective of all authors. The whole emphasis of the paper should be on communication with a wide international coaching readership. Papers can be submitted in English, French and Spanish.

AUTHOR(S)

When submitting articles authors should indicate their name(s), nationality, academic qualification(s) and representation of an institution or organisation that they wish to appear in the paper.

SUBMISSION

Articles may be submitted at any time of the year for consideration for future publication. Articles should be sent by email to the following e-mail address: coaching@itftennis.com. In calling for papers, the Editors ask that contributors adhere strictly to the guidelines. Views expressed by contributors are their own and not necessarily those of the Editors or publisher. No fees are charged for submitting articles or having them published.

REVIEW PROCESS

Manuscripts with insufficient priority or quality for publication are rejected promptly. Other manuscripts are reviewed by the editors and associate editor and in some instances, articles are sent for external review to expert consultants on the editorial board. Author identities are known by reviewers. The existence of a manuscript under review is not revealed to anyone other than peer reviewers and editorial staff.

NOTE

Please note that all articles commissioned for ITF Coaching & Sport Science Review may also be used on the ITF's official website. The ITF reserves the right to edit such articles as appropriate for the website.

OPEN ACCESS AND COPYRIGHT

The ITF Coaching and Sports Science Review is a free publication and no fee is charged in order to access and download the publication. Copyright on any article is retained by the author(s). Regarding copyright transfers please see below.

Authors grant the ITF a license to publish the article and identify itself as the original publisher.

Authors grant the ITF rights to use the article for its tennis development activities, i.e. in courses, educational materials, publications, websites, bulletins, etc.

Authors grant any third party the right to use the article freely as long as its original authors and citation details are identified.

This publication and any associated published material is distributed under the [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/)

INDEXING

ITF CSSR is indexed in the following databases: COPERNICUS, DIALNET, DICE, EBSCO HOST, LATINDEX, RESH, SCHOLAR, SPORT DISCUS



ITF Ltd, Bank Lane, Roehampton,
London SW15 5XZ
Tel: 44 20 8878 6464
Fax: 44 20 8878 7799
E-mail: coaching@itftennis.com
Website: <http://www.itftennis.com>
ISSN: 2225-4757
Photo credits: ITF

ITF Coaching:
<https://www.itftennis.com/en/growing-the-game/coaching/>

ITF Development
<https://www.itftennis.com/en/growing-the-game/development/>

ITF Tennis Play and Stay website:
www.tennisplayandstay.com

ITF Academy website:
<http://www.itf-academy.com>
ITF Junior Tennis School:
www.itfjunortennisschool.com/
ITF World Tennis Number:
www.worldtennisnumber.com

The **Tennis Anti-Corruption Program (TACP)** is in place to protect the integrity of our sport and protect you as coaches and all those within tennis against corruption and betting related offences. This document provides a summary of the anti-corruption rules, for the full list please visit www.tennisintegrityunit.com.



Coaches

Betting

- ✗ **DO NOT** bet on any tennis event, at anytime, anywhere in the world or assist others to do so
- ✗ Betting companies **MUST NOT** sponsor, employ or provide any other benefits to you in exchange for yours or your player's services

Match Fixing

- ✗ **DO NOT** ask or help any player to fix the outcome or any aspect of a tennis event (this includes spot fixing of points, games or sets or attempting to manipulate the draw in any way)
- ✗ **DO NOT** ask or help any player to perform below their best efforts in a tennis event

Inside Information

- ✗ **DO NOT** share non-public, sensitive information about a tennis event or a player for betting purposes with anyone
- ✗ **DO NOT** offer to provide any non-public, sensitive information to anyone in exchange for money or any benefit

Wild Cards

- ✗ **DO NOT** accept or give money or any form of compensation in exchange for a wild card on behalf of or for the benefit of a player, whether or not the player has knowledge of your actions

Reporting Obligations

- ✓ **YOU MUST** report any knowledge or suspicions of corruption to the TIU
- ✓ **YOU MUST** inform the TIU as soon as possible if you are approached by any person who offers money or any benefit to influence the outcome or any aspect of a tennis event or asks for inside information
- ✓ **YOU MUST** cooperate fully with investigations conducted by the TIU, which may include being interviewed or providing your mobile phone, other devices or relevant documents



You have a responsibility to ensure that you and your players are aware of and comply with the rules of the TACP. As a coach you are covered by the TACP and will remain covered for two years following the last event you received accreditation to.



If you break the rules, or conspire to do so, you could face a maximum fine of \$250 000 and a lifetime ban from participating in, or attending tennis events.

For further information, to report corrupt activity or if you have any questions download the TIU app or contact us using the links below:



www.tennisintegrityunit.com



education@tennisintegrityunit.com



+44 (0)20 8392 4798



Dear CSSR Reader,

We are pleased to announce the launch of the online ITF Academy - an online educational resource which provides information and education; and enhances the certification pathway.

The ITF Academy is available to National Associations, coaches, players, fans, parents and anyone interested in tennis or sport in general.

The ITF Academy will launch over three phases between 2019 and 2020:

- **Phase 1, March 2019:** The Information and Education phase will see the release of online short courses and a brand-new iCoach library within the ITF Academy.
- **Phase 2, from July to December 2019:** The Certification phase will see the launch of blended learning (online combined with face-to-face delivery) certification courses - the ITF Play Tennis course will be the first course to be made available, followed by the ITF Coaching Beginner and Intermediate players course.
- **Phase 3, through 2020:** The Continuous Professional Development (CPD) phase will build on the already available short (online) courses through automated tracking and calculation of CPD credits/hours.

Head to the ITF Academy to browse through the courses as well as the latest iCoach content from around the world.

Please contact our coaching team at coaching@itftennis.com if you need more information on the ITF Academy, or follow the following link to register:

www.itf-academy.com

