International Tennis Federation

COACHING & SPORT SCIENCE REVIEW

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International Tennis Federation

COACHING & SPORT SCIENCE REVIEW

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

EDITORIAL

Welcome to issue 79 of the ITF Coaching and Sport Science Review. This issue covers a range of aspects in the game including energy demands for different surfaces, the transition to the yellow ball, aerobic fitness training, the commitment of pro players, the influence of height and service performance, variability in technique, and more.

The 21st ITF Worldwide Coaches Conference by BNP Paribas took place in Bangkok, Thailand from 25-27 October 2019 at the Berkeley Hotel, Pratunam where a state-of-the-art real clay court was constructed, courtesy of Vigano Pavitex. Speakers included Mary Pierce, Emilio Sánchez, Eric Winogradsky, Beni Linder, Merlin van de Braam, Jo Ward, Li Chen, Michael Ebert, Craig O'Shannessy, and many more. Almost 600 coaches from over 110 countries were in attendance, making this edition one of the most successful to date. The conference theme 'Maximising the player's journey: the coach as a facilitator and team leader' saw speakers present on several topics, giving insight into the most recent tennis coaching methods and knowledge. Craig O'Shannessy, Emilio Sanchez, Mary Pierce and Beni Linder particularly captivated the crowd with sessions on: deep analysis of tactics in coaching; skills and drills from the ASC Academy; the future of women's tennis and, physical conditioning. 2020 will welcome back the ITF Regional Coaches Conferences series. Information on registration will be published in due course.

On the Participation front, following the success of the 2nd ITF Worldwide Participation Conference in July, organisation for the 2020 edition of the ITF Worldwide Participation Conference is underway and further details will be shared over the coming months. The presentations from both the 2019 and 2018 editions can be found at www.itf-academy.com. The ITF has also just published the Global Tennis Report 2019, the largest survey of worldwide tennis participation and performance ever undertaken in the sport. The report contains data gathered from 195 tennis nations to give a game-changing insight into the global tennis landscape. Both global and national findings are presented in the report, facilitating analysis of global and regional trends. The Global Tennis Report 2019 can be accessed from the ITF Ebooks App, downloadable from Google and Apple App Stores. 150 publications are now available on the ITF Ebooks App across 7 languages.

During the ITF Worldwide Participation Conference 2019, the ITF officially announced the launch of the ITF World Tennis Number. This strategic project is to implement a global, level-based tennis rating, designed to enable more matches to be played between players of similar levels, from beginners to professionals. The ITF World Tennis Number will offer a portal to players and national associations to facilitate more and better competition. To date, 23 National Associations and two Regional Associations have shared data with the ITF to help develop a better-quality rating system and player experience. The system and portal are in advanced stages of development and the launch will be announced in due course. More information can be found at www.worldtennisnumber.com.

The ITF Academy, the ITF's online educational platform, was officially launched in March 2019. The ITF Academy offers online courses which will eventually support the face-to-face delivery of courses, providing an improved blended learning experience. The ITF Academy now also hosts Tennis iCoach and all the content from the soon to be discontinued www.tennisicoach.com is now available at www.itf-academy.com. Presentations from the recent ITF Worldwide Coaches Conference held in Bangkok are already available with more presentations available over the coming weeks. To date there are a total of 9 courses in English on the ITF Academy, some of which are also available in Spanish and French, and with many more on the way. Click here to register for 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 79th edition of the ITF Coaching and Sport Science Review.

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The commitment Challenger Tour players make as junior athletes

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ITF Coaching and Sport Science Review 2019; 79 (27): 3-5

ABSTRACT

Professional tennis players competing at the Challenger Tour level were interviewed to further understanding of how professionals perceive their advancement. Results showed athletes make extensive commitments to facilitate advancement. Commitments that likely impact their career options after tennis. Implications and suggestions for moving forward are discussed.

Key words: Advancement, career development, commitment, professional players

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INTRODUCTION

Sport plays a prominent role in society. Today, thousands of children participate in sport programming with the ambition of becoming a professional athlete. The increasing popularity of sport has contributed to the development of a youth sport industry worth an estimated $15 billion (Gregory, 2017). This booming industry has impacted the youth sport experience, causing aspiring professional athletes to spend increasing amounts of their childhood in the sport environment (Brustad, 2011). By spending more time training for their respective sports, athletes are therefore likely spending less time pursuing other activities. Yet, little research exists that examines how athletes advance from youth to professional sport from those who have done so successfully. The purpose of the current study then, was to examine professional tennis players' perception of their advancement and how the extent of their commitment may impact their post-sport careers.

LITERATURE REVIEW

The study was guided by Green's (2005) essential tasks for sport development. Specifically, the study was guided by the concept of commitment (a key underlying concept of retention), and the essential task of advancement. Commitment was used as it can explain the steps taken to manage their elite development. Our current understanding of athlete advancement is lacking, which is concerning as advancement is not guaranteed (Green, 2005). This study will therefore contribute to a subject area lacking scientific study.

Research investigating athletes' retirement from sport shows they are often ill-prepared (Stronach & Adair, 2010). This is concerning as most professional athletes will need to transition directly into another career post-sport. This is especially true of professional tennis players, as research has shown only those in the top 100 experience financial independence (Brouwers, Sotiriadou, & De Bosscher, 2015a). Most professional tennis players, therefore, struggle to earn a living.

Our understanding of athletes' transition out of sport is limited as retirement is often viewed as a single event (Stambulova & Roessler, 2010). Interventions for improving this experience therefore often fail to account for the athlete's entire journey. This is problematic as athletes make commitments in youth that may impact their post-sport career preparedness. The current study set out to answer the following research questions:

1. What commitments do current professional tennis players believe are necessary for advancement?
2. How does professional tennis players' commitment to their sport impact their personal development?

METHOD

A narrative inquiry approach (Clandinan, 2006) was adopted to explore participants' entire journey. Six male participants were recruited from a Challenger Tour tournament in the Midwest, United States. Participants rankings ranged between 200-600. Below, Table 1 illustrates Crespo et al's (2003) breakdown of tournament and ranking levels.

Table 1. Breakdown of rankings required at each tournament level

Ranking	Tournament Level
Unranked – 600	Qualifying Futures
600 – 300	Main Draw Futures
400 – 250	Qualifying Challenger Events
300 – 130	Qualifying Grand Slam Events
250 – 100	Main Draw Challenger Events/ Qualifying ATP Tour Events
130 – 1	Main Draw of ATP Tour Events
110 – 1	Main Draw of Grand Slams

Interviews were coded separately by each researcher. A priori, thematic coding technique was adopted as recommended by Saldaña (2014). Any discrepancies in researchers' analyses were discussed until consensus was achieved.

RESULTS

Players' advancement appeared to depend on a relentless commitment to tennis. Participants relocated as children for tennis, usually without their families, and reduced time in traditional schools. This commitment may, therefore, have impacted their ability to acquire additional qualifications and life-skills, likely diminishing their post-tennis career opportunities. Three themes emerged: Commitment, retention, and advancement. Findings are presented in chronological form using Côté's (1999) Developmental Model of Sport Participation.

Specialization Phase (age 13-15)

Commitment. By age 13 professional athletes had begun or were in the process of increasing their dedication to tennis. This meant leaving traditional school settings, relocating, and/or dropping other sports. As Player 1 from Spain described: "I began to make sacrifices for my tennis around age 13/14. I attended a school specifically designed for kids playing sport as seriously as I was. At this school I was able to spend 4 hours a day training both on and off the court".

Player 5 from South Africa also adjusted his scheduling at a similar age for his tennis: "By 14 I shut down my participation in other sports so I could practice 5 times a week." Few participants discussed retention during this phase. They also saw their increasing commitment to tennis as key to enabling advancement.

Investment Phase (15-18)

Commitment. At this stage, participants began to grapple with balancing their tennis and education. Most felt compelled by to structure their schooling around their tennis, as Player 2 from the US elicited: "If I wanted to play at a high level in college while staying in high-school that's what it was going to take. Classes at 6:30a.m., so I could leave school early and drive the hour or so to practice where I would often be till 9p.m.

Advancement. Players also discussed being short of viable advancement options. For instance, Player 4 from the US stated: "My family couldn't afford for me to stay home and work with my coach as much as I would need. So relocating and accepting the academy's scholarship was my only option." Player 5 had a similar experience: "I got the opportunity to move from South Africa to Boston. My parents couldn't afford much so if I wanted to give it a go then this was it."

US College or Professional Tour (18+)

Advancement. When transitioning into senior tennis, participants had to choose between going to college or turning professional. Of the six interviewees, five initially chose college tennis, as Player 6 from the US explained: "I knew to break-even I'd need to be around 300 and I wasn't even close. My family could only fund me for a year, so college was a no-brainer." Player 3, also from the US, saw it as an opportunity to delay the risks of turning professional: "In college I could mature, train and compete with good players at no expense. Then I could have another crack at going professional." Player 1, the only player to transition directly into pro tennis explained: "I did think about college, but decided against it. I had been a top junior player in Spain so thought I would make it."

Professional Career

Retention. Many players appeared to struggle with life on the professional tour. Player 5 mentioned: "I am away from friends and family for 8 to 9 months a year. I've been traveling alone these last two months. I will certainly sit down at the end of the year and see how much longer I can do this." Only two players contemplated life after tennis. For example, Player 1 described: "There are days I want to quit, especially after a run of bad tournaments. But what else am I going to do? All I have is a diploma from an academy. That's fine if you want to work in a supermarket, but that is not my goal".

The lack of alternatives to tennis was being addressed by Player 5, who said: "I'm finishing my degree online. Rather than just sit in the hotel room for hours, I study. I'd ideally like to stay in tennis, but I don't see myself as a career coach."

DISCUSSION

As professional coaches and tennis experts, players relocating and restructuring their schooling to facilitate advancement will not come as a great surprise. However, it is important to recognize the impact extensive levels of commitment may have on athletes' careers after tennis. This matters as most professional tennis players will need to be ready to transition into a new career, which they appear unprepared for. The findings of the current study therefore contribute to our understanding of retirement and demonstrate the need to account for athletes' entire journey.

Findings also suggest reaching the professional level of tennis may depend on players' willingness to prioritize tennis above all else. Fortunately, the existence of the US collegiate tennis system provides players with an option for continuing education, while proving a viable avenue to professional tennis. However, while retiring with a degree is certainly advantageous, a lack of relevant work experience would leave players eligible for little more than entry-level positions.

It is unrealistic to think the required levels of dedication and commitment will ever abate. To the contrary, moving forward, one would expect even greater dedication and commitment will be required. It is not the authors' expectation, or ambition to reinvent the wheel. Rather, we hope to raise greater awareness of this issue, with the long-term objective of developing and implementing measures that equip players with greater post-tennis career possibilities. Especially, as the post-career support has been found to rank low on tennis experts' list of policy concerns (Brouwers, Sotiriadou, & De Bosscher, 2015b).

Further examination is clearly warranted. Ensuring youth players and their support teams are aware of the need to prepare for a career after tennis should be the first step taken. Future research should then look to determine what measures are feasible in the current tennis system/environment.

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RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

ITF Academy

The influence of player height on service performance in professional female tennis

Alejandro Sánchez-Pay, José Antonio Ortega-Soto & Bernardino J. Sánchez-Alcaraz (ESP)

ITF Coaching and Sport Science Review 2019; 79 (27): 6-7

ABSTRACT

The aim of this study was to analyze the influence of female player height on service related parameters. Statistics on service performance and height of female players were gathered from the second round onwards in all Grand Slam tournaments. Findings showed that the taller the player, the higher the serve average speed, serve maximum speed in, number of aces and number of points won with the first service (%), however, the number of double faults will increase as well. The Wimbledon surface (grass, fast court) favours taller players, who win a higher percentage of points with their first services here when compared to other surfaces. The findings of this study help to recognize the influence of height in female tennis in service related parameters, as well as the differences between the surfaces.

Key words: Biomechanics, height, tennis, female.

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INTRODUCTION

Currently, tactical analysis has been promoted by the continuous advance in technology, which allows for recording of great quantities of data and the creating of sport statistics in a simple and clear manner (Rein & Memmert, 2016). Grand Slam tournament websites provide detailed information of matches being played and completed (Cross & Pollard, 2009). The statistics gathered help to make a more comprehensive and better quality data analysis at the end of each match (Katić, Milat, Zagorac, & Durović, 2011), which can be used to determine different important influences on the game

Of all the information from official websites, the serve is the aspect on which the most data data (speed, direction, efficacy, effectiveness, etc.). This may be due to the fact that the serve is often considered to be a key factor in determining the result of a tennis match (Giampaolo & Levey, 2013). It seems that high speed hitting, combined with a high percentage of first services, increases the probabilities of winning a match (Brody, 2003).

Whilst a lot of information related to the professional service exists, information on the female service is scarcer. The aim of this study is to analyze the influence of female player's height on their serve performance.

METHOD

Sample

The sample for this study consisted of a total of 580 sets from 252 matches played in all four Grand Slam matches (149 sets at Australian Open (AO), 134 at Roland Garros (RG), 146 at Wimbledon (W) and 151 at US Open (US), all of them in the ladies category. All matches from the second round onwards in all tournaments were recorded and analyzed. Unfinished matches, due to disqualification or withdrawal of a player, were not included.

Procedure

Ladies competition statistics of the four Grand Slam tournaments (AO, RG, W, & US) were gathered. An Excel sheet was created to gather the information published at the official website of each tournament (https://www.ausopen.com; https://www.rolandgarros.com; http://www.wimbledon.com/index.html and https://www.usopen.org/index.html). The variables selected for the performance were: height of the female player, aces, double faults, % of first serve in, % of points won with the first serve, % of points won with the second serve, average serve speed (km/h) and maximum speed of the service (km/h).

Statistical analysis

A descriptive analysis of the data included the mean (M) and standard deviation (SD). A frequency analysis was conducted which resulted in 9 height groups. The Kolmogorov Smirnov test was used to contrast the normality of the data for each variable. A lineal regression analysis R^2 was conducted to examine the possible influence of height on the selected variables. Analysis was performed with SPSS software for Windows (Version 20.0. Armonk, NY:IBM Corp.).

RESULTS

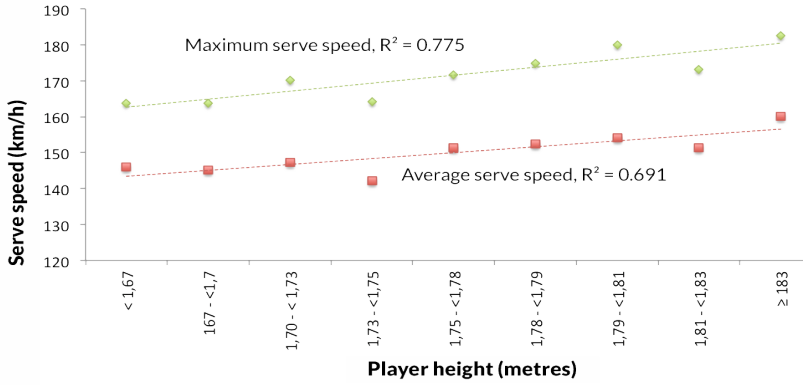

Figure 1. Relationships between the average serve speed and player height, and max. serve speed and player height.

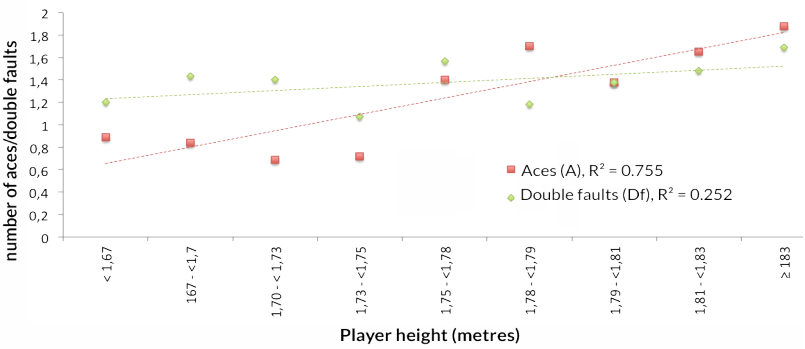

Figure 2. Relationship between the number of aces and player height, and double faults and player height

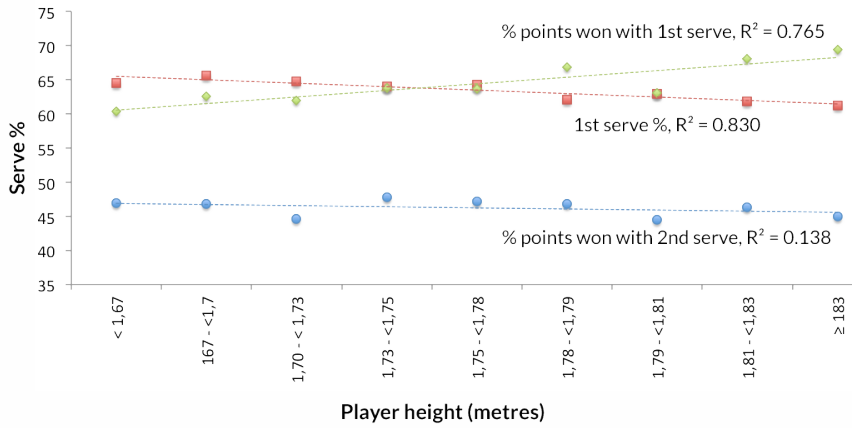

Figure 3. Relationships between the percentage of first serve in and player height, and points won with the first and second service player height.

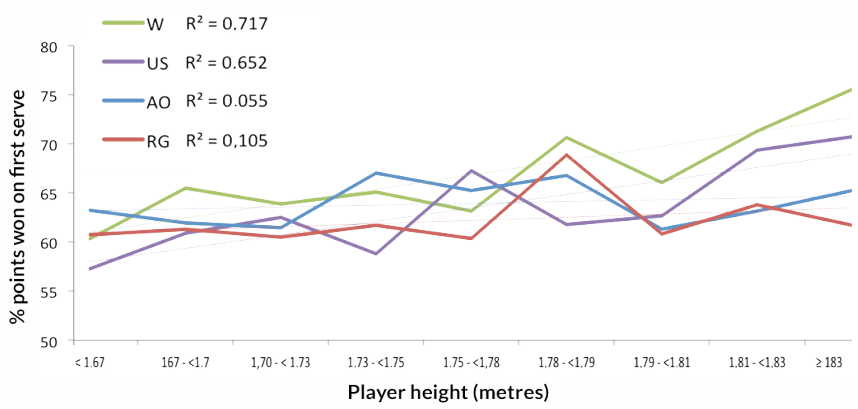

Figure 4. Relationships between player height and the percentage of points won with the first serve at each of the Grand Slam tournaments (W: Wimbledon. US: US Open. AO: Australian Open. RG: Roland Garros).

COMMENTS

Previous studies have shown that when the height of the player increases, so does the speed of the serve (Bonato et al., 2015; Fett, Ulbricht, & Ferrauti, 2018). This same correlation is seen in this study, which uses competition statistics. From a biomechanical point of view, longer body segments allow for more powerful lever movements. This longer length of levers, together with the correct sequencing of body segments in the kinetic chain of the serve, allows taller players to hit the ball harder.

Likewise, taller players are able to hit the ball at a higher point of impact, thus, they have the ability to hit serves with greater angles. This can be one of the reasons that the taller the player, the greater the number of aces (Figure 2). A faster service provides a greater number of aces but, in turn, a lower percentage of points won with the first serve (Figure 3).It could be the case that the taller the player, the greater the intention to win points straight from the service or an error in the return of the opponent. Thus as the height of the player increases, the number of points played with first serve decreases and the number of double faults increases (Figure 2).

The percentage of points won with the first serve has been one of the most analyzed parameters indicating performance and which have greater impact on the performance of the match (Katić et al., 2011). As we said above, the taller the player, in general, the greater the number of points won with the first serve (r2 = 0,765). One particular comment is that the surface does not seem to impact in the same way the relationship between player height and percentage of points won with the first serve on each surface (Figure 4). Thus, while at RG tournaments (clay surface, slow court) or AO (hard surface, medium speed) the percentage of points won with the first serve increases slightly as the height of the player increases (r2 = 0,105 and r2 = 0,055 respectively), at the US tournaments (hard surface, medium-fast speed) or W (grass surface, fast court) this percentage increases significantly. This relationship (% of first serves won with height of the player) is stronger at Wimbledon. Wimbledon grass has a lower friction coefficient than the other surfaces (O'Donoghue & Ingram, 2001), thus, the loss of speed of the ball after bounce is the lowest of all of the four tournaments. Despite the introduction of the slower balls by the ITF on faster surfaces to balance the playing speed, and make rallies last similarly, there are still great differences in the different surfaces.

CONCLUSIONS

The findings of this study demonstrate the significant influence of the height of the female player in service performance. Taller players reach greater hitting speeds, increasing the percentage of points won with the first services and the number of aces. The fastest surface (grass) favours taller players, increasing the percentage of points won with the first serve when compared to the other surfaces.

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The differences in energy system demands of competitive male tennis play between fast and slow courts

Anna Skorodumova & Igor Baranov (RUS)

ITF Coaching and Sport Science Review 2019; 79 (27): 8-10

ABSTRACT

This study investigated the energy system demand differences between matches played on fast courts and on slow courts of high-performance male players. Matches of Grand Slam matches played by Russian players were analysed. External indicators as such in-point playing time as a proportion of total match time were used to conduct the analysis. Data analysis found significant differences in all measured external indicators such as average match playing time, number of points and in-point time. Results also found a significant difference between match motor density (the percentage of total match time that made up effective playing time) for the two surface types, with the slow surface (clay) match motor density being significantly higher than that of the fast surface (grass and hard court), 14.5% and 12.9%, respectively. Subsequent analysis of point length reveals that slow courts had a significantly higher percentage of points that lasted more than 10 seconds whilst fast courts has a higher percentage of points under 10 seconds in length. It can be concluded that due to the length of the points, tennis primarily employs the ATP-PCr energy system for energy use, dipping into the anaerobic lactic acid energy pathways more on clay court matches. Whilst the aerobic pathways are not employed heavily in-point, they are still essential, possibly even more on clay court due to greater taxation on the anaerobic lactic acid pathway, as they provide the basis for ATP re-synthesis between points. This signals toward endurance as a major component of fitness in tennis.

Key words: energy systems, fast and slow courts, metabolism, tactics

Article received: 20 August 2019

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INTRODUCTION

Staff at the FSBI Federal Science Centre for Physical Culture and Sport, Moscow conducted a study of the external indicators of energy system demands of male tennis players during competitive matches played on slow surfaces and fast surfaces. 25 matches on clay courts (slow surfaces) and 30 matches on hard and grass courts (fast surfaces) from Grand Slam tournament matches, including the finals and semi-finals as well, in which Russian male tennis players participated, were researched and analysed.

RESULTS

The average external indicators of energy demands obtained from the study of the matches are presented in table 1.

Table 1. Average external indicators of energy system demand of male competitive play on fast and slow courts

Indicator	Surface Type		Differences
	Slow	Fast	P value (* = significant)
Total match duration, min	148.6±41,98	125.43±55.05	0.01*
"Clean" match time (Actual in-point play time), s	1293.20±520.78 1	978.10±457.84	0.01*
Number of sets per match	3.4±0.97	3.13±0.94	0.01*
Number of games per match	32.8±10.48	29.87±1.84	0.01*
Number of points per match	206.10±62.10	193.20±73.93	0.05*
Total number of shots per match	1066.92±436.43	974.83±406.93	0.01*
Average point length, s	6.27±1.13	5.05±0.80	0.01*
Motor density, %	14.5±2.25	12.9±2.35	0.01*
Point rally pace, shots/min	24.40±1.58	27.09±1.28	0.01*

The average values of match motor density (the ratio of actual in-point play time to the total match time, expressed as a percentage) demonstrate that for only 14.5% and 12.9% of match time on average, depending on court surface type, are tennis players actually engaged within a point. For the rest of the time, players prepare for the serve or return, change sides of the court, or rest, etc.

During actual in-point play time, 193-206 points are played depending on court surface type on average, and the profile of the duration of the points played on each court type is also different.

The percentage profile of whether the points were less than or more than 10s in length for each surface type are presented in table 2. Research from recent years shows that after 6-10s of close to maximum intensity work, stocks of creatine phosphate diminish to the point that the creatine phosphate reaction stops being the main mechanism of ATP resynthesis (Cheremisinov, 2016; Jansen et al., 2016), and the longer the work is, the bigger the role of lactic acid anaerobic sources in power supply.

Table 2. Percentage profile of points being either less or more than 10 seconds in length in matches of male tennis players on fast and slow courts

Surface type	Duration of points (%)	
	≤10 s	>10 s
Fast	86,82 ± 4,36	13,18 ± 4,36
Slow	83,20 ± 5,31	16,80 ± 5,31
Differences	Significant	Significant

DISCUSSION

Thus, in a game on fast-paced courts, tennis players play larger percentages of points less than 10s in length, than on slow courts, and on slow courts, the percentage of the points played lasting more than 10 s was more than on fast courts. It is important to note that the differences between the percentages of points played that are under 10s and over 10s on fast and slow courts are statistically significant and they need to be considered when drawing up plans of training.

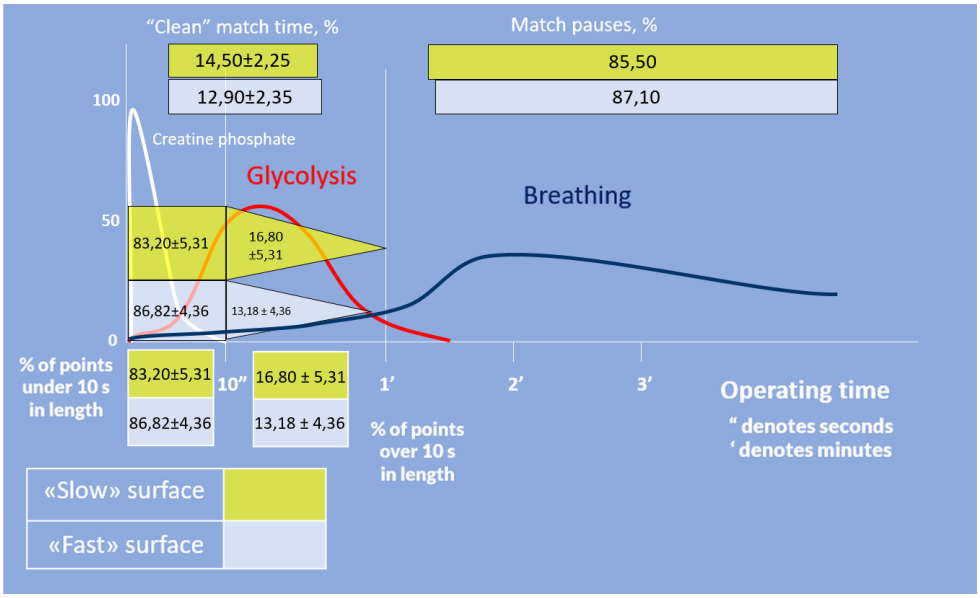

Figure 1. The use of different energy systems for ATP re-synthesis during tennis matches of men on different surfaces, split by length of point (% of time)

Therefore, of 14.5 % of match time on a slow and 12.9 % on a fast pace court surface (clean match time or in-point effective playing time), 83.2-86.8 % depending on court surface type could be seen to be met primarily with the anaerobic lactic acid free energy system – the ATP-PCr pathway, whilst 16.8-13.18% of effective play time energy needs are provided by lactic acid anaerobic systems (Cheremisinov, 2016; Jansen et al., 2016). 85.5-87.1 % of match time (out-of-point time), depending on the type of court surface, is provided with aerobic abilities and, of course, readiness of the athlete to play the following point will depend on their power and efficiency.

Schonborn (1987) considers that the different energy systems are involved in tennis in the ratios of: anaerobic lactate free (ATP-PCr) – 70 %, anaerobic lactic acid – 20 %, and aerobic 10 %). It would be possible to agree with this statement if a match was only one point in length.

However, in our opinion, big requirements are imposed on aerobic abilities in a match due to the fact that for more than 80 % of match time, they provide the player with ATP resynthesis after each point. The more intense and the longer the point, the higher the rate of aerobic transformations. The leading contributor in rate of aerobic process speed is the ATP/ADP ratio - from the beginning of intense muscular activity and with further increases in intensity, concentration of ATP decreases, and ADP increases.

It is necessary to pay tribute to Roger Federer and experts working with him. Training is conducted in such a way that in a match, on average 73 % of all points are 4 shots or less. Points 5-8 shots in length occur 19 % of the time. Only in 8 % of cases is a point 9 shots or longer (Perov, 2019). It means that 92 % of all points are conducted at the expense of the lactic free anaerobic abilities (ATP–PCr) and only in 8 % of cases, the lactic anaerobic energy system begins to become more active. For comparison, the author provides average values of number of points at different lengths for Novak Djokovic - up to 4 shots in 55 % of cases, 5-8 shots in 26 % of cases and 9 or more shots in 19% of cases, which testifies to a larger possibility of lactic acid build-up, so and bigger requirements to the aerobic productivity of the athlete.

It should be noted that a game on a slow surface shows to have even bigger requirements on the aerobic abilities of tennis players, than on fast, since a higher proportion of time is spent actually in-point play. Even though points may be longer on slow-paced courts, with bigger expenditure of creatine phosphate stores, according to rules of competition, a breaks in play are the same length. During this pause it is necessary to resynthesise creatine phosphate. The greatest contributor to ATP resynthesis is played by aerobic oxidation processes in this case.

Movements during a point can be characterised as high in reaction speed, acceleration, single movement speed, movement frequency (Godik, 2006; Zatsiorsky, 1966); the movements are high-speed and powerful requiring a full array of developed coordination abilities (balance, accuracy, differentiation of muscular efforts, etc.). But tennis players do not play just one point but on average more than 190 points during the match, and this means that the emphasis on the importance of qualities changes. High-speed, power and coordination abilities should be maintained at a high level for long periods of time.

Endurance is the ability to perform work without a change in parameters (in tennis – without reducing intensity, accuracy, variability of actions, speed and explosiveness, etc.) despite the arising exhaustion (Matveev, 1977; Farfel, 1949; Mikhaylov, 1967; Platonov, 2014) and it begins to prevail as the most necessary component of fitness. It is also necessary for the tennis player once the match reaches about 2 hours in duration.

Another aspect that signals to endurance as a major component of fitness is tennis is that the qualities which are necessary for a single point have to be met throughout the entire duration of the competitive activity, which means that high-speed, power, coordination and other abilities have to be maintained not just for a short period of time but long ones.

The conducted factorial analysis of physical and functional fitness of high-performance tennis players and the calculated correlation coefficients between indicators of physical and functional fitness and results of competitive activity confirm the conclusions drawn.

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RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

ITF Academy

Execution redundancy: the effect of varying technique for a similar outcome on players' groundstroke performance

Michael Davis Higuera (GBR)

ITF Coaching and Sport Science Review 2019; 79 (27): 11-13

ABSTRACT

Execution redundancy, defined as varying technique for a similar outcome, is a newer defined type of variability which opens new avenues of thinking about tennis training. 19 club-level tennis players were put through different training interventions: low variability where players had to rally to hit a target and maintain technique; and, high variability where players did the same but varied technique slightly. The high variability group improved after a retention period of 1 week in a test of accuracy (measuring average distance of 4 balls hit to a target) and success (measuring number of balls over the net and within a target radius of 500cm). The results suggest that that varying technique for a similar outcome improves performance more than low variability, possibly due mechanisms surrounding increased exploration creating better adapted motor patterns. The results show positive support for variability of this kind of training, but care needs to be taken to ensure that sound biomechanical and technical principles are observed.

Key words: variability, execution redundancy, varying technique, methodology

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INTRODUCTION

Variability should be an essential part of every coaches toolkit, present within every teaching methodology in different ways, such as: discovery learning, by allowing the player to explore different solutions to solve a problem (Crespo and Miley, 1998); in variable practice - varying the different situations of practice (the incoming ball) (Pankhurst, 2013); in varied practice – varying the outcome of the shot (Pankhurst, 2013) ; or even, in distributed or random practice (Shea and Morgan, 1979; Reid et al., 2006) - varying the order of practices and intertwining learning of one skill with others.

Even with a beginner trying to adhere to a very strict technical model, variability is present as the learner is exploring motor solutions to try to replicate the skill and outcome. In the same way, a high-performance player trying to hone a skill performs many slightly varying repetitions in order to improve the outcome. However, this does not mean that high amounts of variability should always be prescribed. A good coach is one who is able to decide which different learning styles and coaching methodologies are suitable for each player in each situation (Crespo and Miley, 1998). Thus it is the coach's duty to understand that variability is present in the learning process in one way or the other as well as decide how to best prescribe this variability.

The mechanisms of why variability may lead to better learning have been put down to explanations of: contextual interference - constant forgetting and recall of different skills or variations of skills in a random order facilitating improved consolidation (Shea and Morgan, 1979) through deeper perceptual trace (Adams, 1971); schema theory - variation and repetition adding to a general motor programme through schema (or rules) (Schmidt, 1975); noise and stochastic resonance (Schollhorn et al., 2006) – the clashing of brain signals caused by internal movement and external situations causing the player's movement dynamics to move out of dips of complacency in order to find better solutions; and, dynamic systems (Davids et al., 2008) - where exploration of the movement-skill-outcome landscape (made up of individual, task and environmental constraints) leads to increased ability to perform successful skills more adapted to the individual's capacities and predispositions.

According to the aforementioned theories, the final two especially (Davids et al., 2008; Schoolhorn et al., 2006), the mechanism behind learning may be non-linear, which is to say that because of the confluence of many different factors and degrees of freedom, training one aspect may lead to a change in an unrelated aspect. However, the theory of specificity of practice suggests that the best training for a test occurs when the training is the same as the test (Shea and Kohl, 1990). In terms of variability, this would imply that to best improve the ability to vary in a certain way, i.e. different shot placement, switching between tasks, or hitting from different situations, then practice should occur in the same way.

One less-studied category of variability is that of that is varying technique whilst maintaining a similar outcome, which could be termed execution redundancy (Ranganathan and Newell, 2010; 2013). This type of variability contrasts with task-goal (structured or unstructured) variability (Ranganathan and Newell, 2010) - varied, variable or even random practice.

If the specificity of practice theory is believed to be absolute in the mechanism behind this type of variability, changing technique in small ways for a similar outcome would only improve performance where this type of variability was required, i.e. where changing technique was important. It might seem counterintuitive to train this type of variability as it stands to reason that if a specific outcome is desired, then the skill should be executed in the same way; however, in tennis, top players respond to hopeless

situations with winning and unexpected shots. Thus, this type of practice would benefit performance where a player is under time or space pressure/constraints and must adapt their technique in order to succeed.

If the specificity of practice theory is not believed to be absolute, then execution redundancy, or changing technique slightly for a similar outcome, might still facilitate improved learning and training owing from other aforementioned mechanisms of variability (Schmidt, 1975; Shea and Morgan, 1979, Schollhorn et al., 2006; Davids et al., 2008).

Thus, the aims of this study were to investigate whether this type of variability has an effect on training groundstrokes and if so, explore by what mechanisms this effect takes place.

METHODS

The study was conducted as a part of a dissertation in support for a degree award (Davis Higuera, 2018). This experiment aimed to study the effect that asking a group of intermediate/advanced players to vary technique in training for the same outcome had on their stroke effectiveness. Two tests were designed and were carried out to test whether this type of variability fell prey to the specificity of practice theory.

20 club-level advanced recreational players (mean age = 46 years, S.D. = 13 years) gave informed consent for the study and were randomly assigned into two groups, a high-variability experimental group (n=9) and a low-variability control group (n=11). Each group underwent a different practice condition with a pre-test immediately before, immediately after and a week later, for two different types of tests. Shot accuracy and shot success were taken as the main variable dependent variables, and were measured in both tests from 4 shots each test: for shot success by counting how many shots of four shots fed to the player were hit into the court and an area with a 500cm radius from a target; and, for shot accuracy by measuring the average distance of the landing position from the four shots, fed to the player, from a centre mark on the other side of the court (with a maximum score of 500 cm for shots further than this distance and missed shots).

The two tests were as follows: 1) a lower pressure test where a ball machine fed four shots down the middle of the court alternating to the forehand and the backhand slightly of the player standing on the centre mark (starting on the right/deuce side) – to test whether high-variability or execution redundancy would positively affect learning even though the situation does not explicitly require variability/adaptation; and, 2) a higher pressure test as above with four shots but feeding wider more angled shots – to test whether high-variability would cause improvements in a pressured condition where adaptation and variability may be more required, as suggested by the specificity of practice theory.

For the intervention in each group, players were asked to rally in pairs (and a three) from the baseline in a straight line with forehand and backhand topspin strokes for 40 minutes, whilst trying to hit a target approximately halfway between the baseline and service line. The high-variability experimental group was given instructions to make small changes to their technique by exploring slightly different arm configurations through their strokes (changing technique constantly from shot to shot): different degrees of flexion of the elbow and wrist, different follow through positions, and different contact positions relative to the body. The group was monitored and directed by a coach to vary technique stroke to stroke, maintain a topspin rally ball, but still respect effective proven biomechanical and technical principles. The low-variability was not given instructions to vary technique but was still directed to hit a topspin rally ball and maintain solid biomechanical and technical principles.

A two-way repeated measures ANOVA was used to analyse the data for both groups for each test, and the results were analysed using SPSS v.24. The study was approved by the ethics board at Manchester Metropolitan University.

RESULTS

Results are shown for each of the two dependent variables.

Shot success

Figure 1 shows the shot success as measured by the average number of shots (of 4) that were hit over and in, and within 500cm of the target, for both tests.

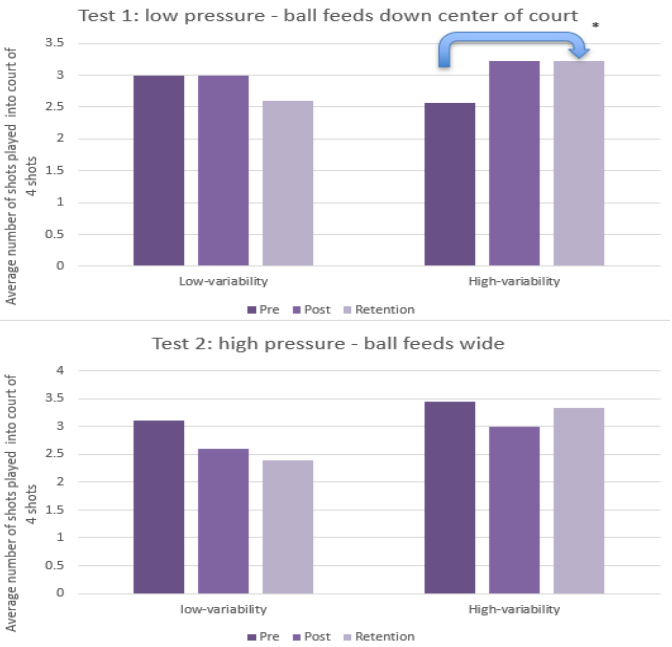

Figure 1. Shot success (average number of shots played in court of 4 shots) for both tests and groups, pre-, post- and 1-week-post-intervention. Bonferroni post-hoc analysis of the pairwise comparisons reveals a significant increase in number of balls played into the court of 0.667, p=0.044, is shown for the high-variability group in test 1 between the pre-test and retention-test only.

Shot Accuracy

Figure 2 shows the shot accuracy as measured by the average distance of the 4 shots per player from a target, where missed shots and shots further than a radius of 500cm from the target counted as 500cm, for both tests

Figure 2. Shot accuracy (average distance form target of shots played into the court of 4 shots with a max. of 500cm for missed shots and shots further than 500cm) for both tests and groups, pre-, post- and 1-week-post-intervention. Bonferroni post-hoc analysis of the pairwise comparisons reveals a significant decrease in distance (increase in accuracy) of 68.69cm, p=0.038, is shown for the high-variability group in test 1 between the pre-test and retention-test only.

DISCUSSION

The results show that training with high variability in execution redundancy has a positive effect on shot accuracy and success, but only in the lower pressure test which suggests that high-variability, and prescribing variability in technique, even for a similar outcome, improves performance. The results do not fully support the specificity of practice theory since the practice of varying technique for a similar outcome should best improve performance in a test where this is required; however, the benefits were not isolated to that test. This means that benefits may be due to a more general mechanism of variable simply stimulating and enhancing the learning process. According to the results, this improvement occurs at retention level only which suggests that time is needed for consolidation, i.e. for the benefits to manifest neurologically.

Accuracy and shot success were the variables measured, and together they translate to shot effectiveness. Shot efficiency was not measured although it may be possible to imply that with increased effectiveness, there may be improved efficiency. What might also be possible to state is that due to the increased effectiveness, the individual has found motor solutions, or variation of solution, which are better suited to the player's capacities resulting in an ability to hit the shots with more effectiveness.

The possible mechanism of improvement is probably explained by a synthesis of the aforementioned theories related to: the shifting of movement dynamics out of complacency (Schollhorn et al., 2006); the player exploring movement patterns more suited to individual capacities (Davids et al., 2008); and, a better developed general motor pattern (Schmidt, 1975).

CONCLUSION

The results suggest that asking players to vary technique slightly for similar outcomes can speed up learning. However, it is important that this type of coaching still follows other well-established coaching principles, sound biomechanical and sound technical principles in order to maximise efficiency and effectiveness.

This type of training might be best reserved for more advanced players. For intermediate players in the associative stage of learning, a coach might show the player the technique, give the player a range of movement which could be acceptable, and then ask them to explore within that range; although, with a total beginner, the player's action is likely to already be variable and so extra variability should not be prescribed. As always, the skill in coaching lies in knowing what the player needs to progress.

With more effective learning, skills potentially more attuned to the player's capacities and players with more autonomy, the potential for more motivated, individual, well-rounded players increases. Many coaches, possibly the best ones, are already using this (probably without knowing it) by not being too prescriptive, encouraging some flexibility and giving players acceptable ranges to work within rather than fixed and inflexible standards/norms.

Although promising, research surrounding specific interventions of variability in tennis is still in its infancy, especially in the context of varying technique, and so the field should be explored further with different populations and under different conditions.

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RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

ITF Academy

The importance of aerobic fitness for tennis: a review (part 1)

Cyril Genevois (FRA)

ITF Coaching and Sport Science Review 2019; 79 (27): 14-15

ABSTRACT

Tennis is an intermittent sport involving different physical components, one of which is aerobic fitness. Scientific research has provided information about the physiological demands of tennis competition and some specific protocols have been developed to combine aerobic testing with technical efficiency testing and training. This paper will provide a rationale behind aerobic fitness training for tennis players.

Key words: aerobic fitness, heart rate, VO2max

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INTRODUCTION

A tennis match is characterized by intermittent exercise, alternating short (4–10 second) bouts of high intensity and short (10–20 second) recovery periods, interrupted by several rest periods of longer duration (60–90 seconds). The running activities of players are comprised of quick accelerations and decelerations but low velocities reflecting the intermittent play involved in tennis, which does not allow high velocities to be reached (Hoppe et al, 2014).

If the crucial muscle actions (movement and strokes) are explosive by nature and rely mostly on anaerobic breakdown of creatine phosphate for energy production, aerobic power (VO2max) is a variable that promotes better physiological recovery between these actions, matches and tournaments. Thus, tennis could be classified as a predominantly anaerobic activity, requiring high levels of aerobic conditioning to avoid fatigue. Indeed, the aerobic fitness status of players may largely determine their capacity to sustain high-intensity exercise during a match and may even influence a player's technical and tactical performance by allowing them to make better choices under fatigue.

It has been suggested that VO2max values >50 ml/kg/min for males and > 42 ml/kg/min for females should be generally considered the minimum standard, with preferably higher values being encouraged for tennis athletes to be able to practice and compete at a high level (Kovacs, 2007). These values are quite similar to those required in most of team sports when competing at a high level. In recent years, scientific research has shown a growing interest in the development of testing protocols allowing for coupled analysis of aerobic fitness and technical production (Baiget et al, 2014; Brechbühl et al, 2016). The goal of this paper is to provide a rationale behind aerobic fitness training for tennis players.

HEART RATE AND PHYSIOLOGICAL STRAIN DURING TENNIS PLAY

Heart rate (HR) monitoring is the most popular indirect method of estimating intensity of exercise and it is used to provide information about the psychophysiological stress associated with match play. During competitive matches, mean HR values ranges between 60–80% of maximum HR (HRmax), with long and intense rallies eliciting values at over 95% of HRmax (Fernandez et al, 2006).

But average HR values should not be the sole measurement of metabolism, as this would not accurately represent the intermittent nature of tennis play and could lead to misinterpretation (figure 1). Thus, the HR-based model defining three intensity zones (low intensity < 70%HRmax; moderate intensity < 85% HRmax; high intensity > 85% HRmax) is commonly used to examine physiological strain during various types of exercise.

The analysis of relative intensity based on the cumulative time (actual – or effective playing time – with the addition of rest periods) spent in these three metabolic intensity zones during simulated tennis play has revealed that players spent more than 75% of the time in the low-intensity zone, with less than 25% of the time spent at moderate to high intensities (Baiget et al, 2015).

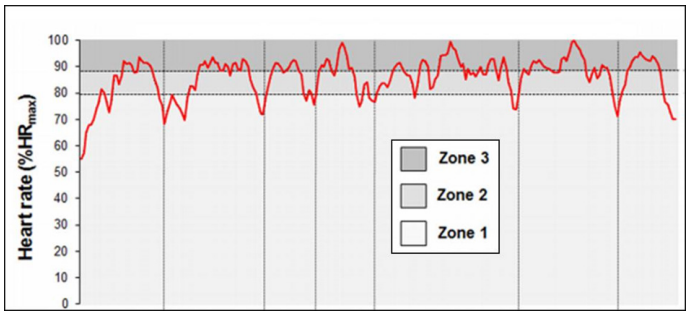

Figure 1. HR variation during tennis match play (adapted from Baiget et al, 2015)

The effective playing time - i.e., the player's activity during the point - based on this distribution, only accounts for approximately 20 to 30% on clay courts and 10 to 15% on hard court surfaces (Ferrauti et al, 2003). During a 60 minute match or set, this means that the player only plays 12-18 minutes and the active or passive rest accounts for 42-48 minutes.

On top of that, HR values can be affected by several factors during a tennis match. For example, it has been shown that a passive strategy (vs an active one) may place higher cardiovascular demands on the players due to longer times spent at elevated (high) heart rates (Hoppe et al, 2019). This is in line with the high relationship found between HR responses and match activity characteristics such as rally duration and strokes per rally, with serve games being more demanding than return games (Kilit & Arslan, 2017).

In the same vein, playing time on clay courts is higher than on hard courts with a lower exercise to rest ratio leading to higher mean HR (Murias et al, 2007). Moreover, the proportion of time spent in the moderate and higher heart rate zones by Elite players during a four-set match were increased following each set indicating increasing stress (Gomes et al, 2011). Thus, not surprisingly, playing style and surface are important factors which should be taken into consideration when designing training plans in order to meet the needs of the player.

In the same way, male tennis professionals performed 50% more total work in a Grand Slam matches than juniors due to the best of 5 sets format. Thus, junior players transitioning to the professional level must adapt to a field of deeper and higher-quality athletes (Kovalchik & Reid, 2017).

Baiget et al (2015) showed that players with better aerobic fitness played at relatively lower intensities and therefore at a lower level of strain and fatigue. This could be a great advantage when players have to play several matches in a short period of time, which has been shown to impair hitting accuracy and stroke positioning (Gescheit et al, 2016).

Finally, when it comes to the performance during incremental field tests specific to tennis, it has been reported that VO2 values - both at submaximal and maximal load - were moderate predictors of players' competitive rankings (Brechbühl et al., 2016; Brechbühl et al., 2018), and that the better aerobic conditioning levels of male tennis players at international levels were associated with better technical efficiency at higher exercise intensities compared with male tennis players at national levels (Baiget et al., 2016).

CONCLUSION

Aerobic fitness is a factor of performance that has to be assessed and improved. The second part of this series will provide coaches with practical testing and training protocols adapted to the specificity of tennis play.

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ITF Academy

The importance of aerobic fitness for tennis: training and testing (part 2)

Cyril Genevois (FRA)

ITF Coaching and Sport Science Review 2019; 79 (27): 16-18

ABSTRACT

In part 1 of this series we discussed why aerobic fitness is important for tennis players (Genevois, 2019). Scientific studies have revealed that High Intensity Intermittent Training (HIIT) is an efficient way to improve aerobic fitness either off- or on-court, depending on the training phase. The intensity of the training sessions can be individualized based on the final speed reached during the 30/15 Intermittent Fitness Test.

Key words: High Intensity Intermittent Training, incremental test, periodization

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INTRODUCTION

Because of the intermittent nature of tennis matches and the alternating demands on energy systems between points and rest, it seems logical that training competitive players should focus on improving their ability to repeatedly perform and recover from high-intensity exercise. For these reasons, tennis training should include physical exercise aimed to enhance both aerobic and anaerobic fitness.

HIGH INTENSITY INTERVAL TRAINING (HIIT) AND ON-COURT TENNIS TRAINING (OTT)

High intensity-interval training (HIIT) consists of repeated, intense exercise bouts separated by passive or active recovery (work and rest intervals ranging from 10 seconds to 4 minutes; at 90–100% of the velocity achieved at the level of VO2max; HR values ≥ 90% of HRmax ; and, work-to-rest ratios of 4:1 to 1:1 to 1:4). It is as a time-efficient alternative to moderate- or low-intensity continuous exercise for improving variables related to endurance and anaerobic performance both for young players (Engel et al, 2018) and adults (Wen et al, 2019). HIIT replicates the intermittent nature of tennis play at higher intensities and appears a viable exercise programming option because the rest intervals between intense work intervals may contribute to reduced discomfort and inducing a more positive affective response (Thum et al, 2017).

Because training time is at a premium, tennis coaches often rely on an integrated approach and they include technical skills during HIIT session – con-court tennis training (OTT). The primary purpose of OTT is to combine improvement of physical conditioning with the maintenance of technical skills in order to optimize the training time. Studies comparing playing (OTT) and non-playing (HIIT) aerobic training in tennis found that the physiological demands (average HR) were greater during the playing session compared to the non-playing session (Fernandez-Fernandez et al, 2011 ; Pialoux et al, 2015 ; Kilit & Arslan, 2019).

This could be related to the involvement of the lower- and upper-limb muscles in hitting the ball. Indeed, It has been reported that running and striking the ball expends 10% more energy than running without striking the ball (Bekraoui et al, 2012). Several studies have shown that OTT protocols are effective in improving aerobic fitness in young tennis players with increase in VO2max of 4.8% (Fernandez-Fernandez et al, 2011), 5.5% (Kilit & Arslan, 2019) and 10.28% (Srihirun et al, 2014). These results are in line with studies using HIIT protocols which showed an increase in VO2max of 6.0% (Fernandez-Fernandez et al, 2012), 5.2% (Kilit & Arslan, 2019), 6.6% (Srihirun et al, 2014).

The main important factor when planning HIIT or OTT is to achieve the required intensity to elicit improvements. for running-based HIIT activity, the speed is calculated as a percentage of the maximal performance obtained during a fitness test - which can vary depending on the test used. For OTT, it is the combination of running distance between every stroke and ball frequency that determines the intensity. It can be assessed during a specific tennis fitness test (Baiget et al, 2014; Brechbühl et al, 2016) or by monitoring the HR response of the players.

REPEATED SPRINT TRAINING (RST)

RST is based on the repetition of « all-out » efforts of short duration (≤ 10 s) interspersed with short and incomplete recoveries (work:rest ratio of 1:4–1:6). This method differs from the traditional HIIT since exercise intensity is maximal, thereby allowing high recruitment of fast-twitch fibres. The goal of RST is to improve the Repeated sprint ability (RSA). One study in tennis showed significant correlations between performances in RSA tests and VO2max (Tsiprun et al, 2013). The aerobic energy system is an important determinant in recovery rate from intense activity and assists in power output maintenance during the RST.

Although the main goal of RST is to improve the Repeated Sprint Ability (RSA), it has been shown to improve VO2peak level by 4.9% in tennis (Fernandez-Fernandez et al, 2012). Moreover, the effects of repeated-sprint training in hypoxia (RSH) – low oxygen state - to induce a larger metabolic stimulus have been explored and have shown greater improvement in some tennis-specific physical and technical parameters compared with similar training in normoxia with well-trained tennis players (Brechbühl et al, 2018).

AEROBIC FITNESS TESTING

Specific Tennis Fitness tests that take into account technical efficiency have been validated scientifically (see part 1 of this series; Genevois, 2019) and could be considered the "Gold Standard". But these tests are exclusively reserved for players in well-structured centres because of the detailed methodology necessary for their successful execution.

For years, national federations have used the multistage fitness test (or 20m shuttle run test) to evaluate aerobic fitness due to its practical implementation and ease of use. However, though it involves change of direction (COD), it is still a continuous incremental test and does not represent the intermittent characteristic of tennis. Thus, a better option to assess aerobic fitness, and to better plan run-based HIIT, is the 30-15 Intermittent Fitness Test (30-15IFT). A complete description of the 30-15IFT protocol and associated materials (audio file and articles) are available online (30-15 Intermittent Fitness Test, 2019).

The 30-15IFT is an intermittent incremental test with 30 seconds of running at increasing speeds, interspersed with 15-second passive recovery periods. Initially, the test was designed in a way where players were required to run back and forth between 2 lines set 40m apart at a pace that was governed by a pre-recorded beep (figure 1). A modified version with 28 m shuttle runs for smaller courts such as basketball, netball and racquet sports is now available as well.

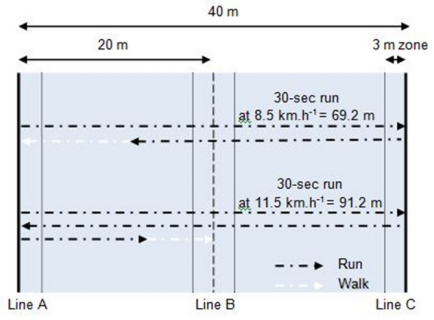

Figure 1. 30/15 IFT protocol with 40 m shuttle runs

Because of the intermittent nature of the test, the final speed reached at the end of the test (VIFT) is a compound measure of maximal aerobic power, anaerobic speed reserve, inter-effort recovery and change of direction abilities, which are important physical qualities involved in tennis performance.

The 30-15 IFT has been shown to be a valid and reliable measure of V02 max (Buchheit, 2005), when compared to the V02 max achieved during a standard continuous test, while being perceived to be less 'painful' due to the 15" rest periods.

The velocity (km/h) attained during the last completed stage (VIFT) is the reference value to individualize speed-based HIIT. But it is important for coaches to understand that the VIFT (i.e. the player's 30-15 IFT score) is not a direct reflection of their maximal aerobic speed obtained with a standard continuous test because of the "anaerobic velocity reserve". Thus, VIFT is on average greater than maximal aerobic speed (VMA) by 15-20% (2 to 4.5 km/h)!!!

IMPLEMENTATION OF HIIT WITH SHORT INTERVALS ON TENNIS COURT USING THE VIFT

General Preparation phase

During the general preparation phase (≈ 6 weeks), the goal is to optimize the time at VO2max. Work intervals from 15" to 30" are used with 2 sessions per week separated by at least 48h (table 1). The running distance is calculated from a set running time and the chosen percentage of VIFT.

The work intensity should be slightly lower than that usual for straight line runs to compensate for the loss of time during changes of direction (≈0.7s/COD). Indeed, changes of direction induce an increase in the anaerobic metabolism solicitation and consequently creates different responses compared with traditional straight line running (Dellal et al, 2010). Although VIFT is the reference to calculate the running distance, adjustments can be made according to the player performance (whether they found it too easy or too hard). Moreover, to compensate for the likely increase in players' fitness throughout the training phase, initial training intensity (%VIFT) should be increased by 2.5 percent every 2 weeks.

Table 1. Examples of high-intensity intermittent shuttle runs using VIFT as a reference for individualising speed interval duration and distance during the general preparation phases, adapted for tennis players.

High-intensity duration (" = seconds)	Intensity (%VIFT)	Recovery duration (" = seconds)	Recovery intensity	Running Mode	Max. series dur.(' = min.)	No. of series	Recovery time between series (' = minutes)
30"	90%	30"	Passive	Shuttle 30m	10'-12'	2 to 3	3'
20"	93%	20"	Passive	Shuttle 20m	7'-8'	2	3'
15"	95%	14%	Passive	Shuttle 10m	7'-8'	2	3'

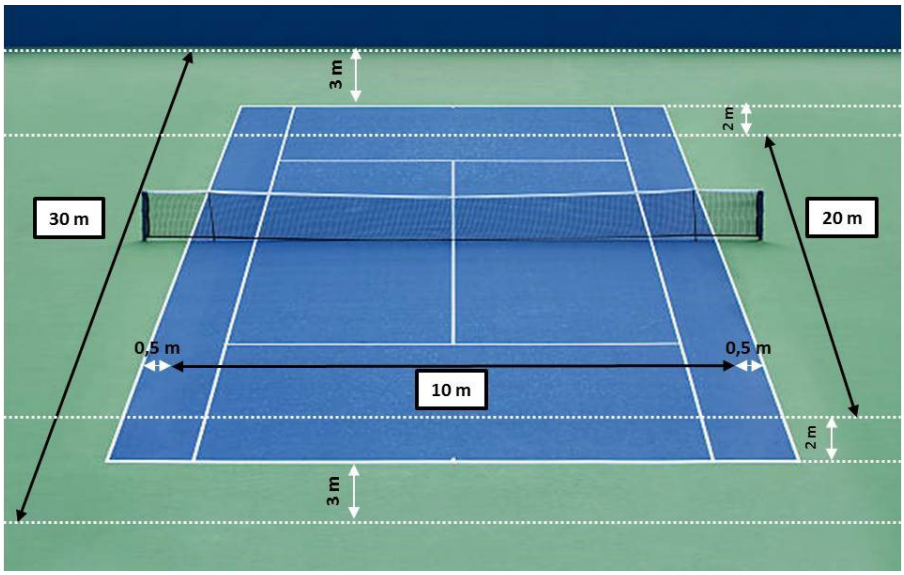

Figure 2. HIIT on tennis court using 10, 20 or 30 m shuttle runs

Specific preparation phase

During the specific preparation phase (≈ 3 to 6 weeks), the goal is to prepare the players for the specific demands of the match. The primary aim is oriented towards the ability to repeat shorts, high intensity bouts – which are related to the peripheral oxydative capacities - using repeated sprint training (1 session) and on-court specific HIIT (1 session). See table 2.

Table 2. Repeated Sprint Training (RST) and On-Court specific HIT during the specific preparation phase adapted for tennis players.

High-intensity duration (“ = seconds)	Intensity	Recovery duration (“ = seconds)	Recovery intensity	Running Modality	Max. series duration (‘= minutes)	Number of series	Recovery time between series (‘ = minutes)
3”	All-out	27”	Passive	Shuttle 5-10m	6’	2	6’-7’ active
10”	RPE>7	20”	Passive	Hitting drills	7’	2	6’-7’ active

During this phase, RST and On-Court specific HIT are performed at least 48 h before strength or speed-oriented training sessions, to ensure optimal player freshness in these sessions.

Competition phase

The competition phase is the most important phase and the goal is to maintain the fitness level that has been previously achieved - while monitoring the training load (high in technical/tactical sessions and specific priority conditioning components such as power). One session per week using on-court tennis HIIT seems to be the most adapted to this period. However, when the strength/power sessions are not programmed in a particular week, another RST session is preferred to compensate for the lack of neuromuscular load.

CONCLUSION

High intensity-interval training (HIIT) is a time efficient way to improve aerobic fitness for tennis players. The 30/15 IFT is an intermittent field test allowing coaches to assess the main player’s overall fitness performance and to individualise training sessions.

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RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

ITF Academy

Understanding the pressures of coaching: insights of young UK coaches working with elite junior tennis players

Callum Gowling (GBR)

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ABSTRACT

Despite a growing body of research into sports coaching there remains little understanding of what it is like to coach elite junior tennis players. The purpose of this study was to examine the lived coaching experience of 8 UK, less experienced tennis coaches and describe what it is like to be a coach of an elite junior tennis player. An Interpretative Phenomenological Analysis (IPA) of 8 less experienced tennis coaches (1 – 4 years-experience) provides a description of how they described elite junior tennis coaching. This study found that (a) self-employment makes coaching competitive, (b) less experienced coaches were surprised by the nature of parental interactions, and (c) less experienced coaches struggled to cope with the reality of coaching and this triggered disillusionment with coaching. The findings of this research contribute to an evolving, problematic epistemology of sports coaching and highlight a need for tennis coach education to improve the preparation of new coaches for their initiation into coaching. The findings present governing bodies opportunities to inform coach education literature and help tennis coaches to sustain themselves in an emotionally challenging role..

Key words: Interpretative Phenomenological Analysis, coaching, elite players, attitudes

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INTRODUCTION

So, what is it like to be a tennis coach? Working outdoors in the sun, getting regular exercise, earning a living by helping others, and keeping your hand in at the sport you've always loved - tennis coaching is a great career. However, like other helping professions (e.g. teachers, nurses, doctors) tennis coaches face challenges that can affect their personal lives, professional relationships, job motivation and mental well-being.

Tennis coaches are performers in their own right as they are required to manage the development and the performance of their athletes through communication, presentation, and psychological skills (Kelly et al., 2018). To be effective, coaches must maintain their mental well-being, so they can observe and respond to the unique characteristics of their athletes. Issues that affect the mental well-being of tennis coaches can change their coaching delivery, their motivation, the relationship with their athlete, and their self-esteem. Furthermore, prolonged periods of stress lead to coach burnout, where coaches stop enjoying coaching and leave the profession (Lundkvist et al., 2012).

This article looks at the experiences of UK tennis coaches, with less than 4 years coaching experience and shows some of the issues that they find challenging. For example, tennis coaching is competitive because many UK tennis coaches are self-employed. The self-employed nature of tennis coaching makes developing positive professional relationships difficult because of the coaches' need to sustain their self-employed income. Understanding the challenges that tennis coaches face and the affect such challenges have on their attitudes can help educators and governing bodies prepare new coaches for what lies ahead of them. This report highlights that young tennis coaches find their role competitive and challenging because of regular conflicts with parents. The evidence suggests that coaches with less than 4 years-experience struggle to cope with competition and conflict in coaching and this has triggered disillusionment with coaching.

METHOD

This study was an interpretative phenomenological analysis (IPA) of 8 less experienced tennis coaches who worked with elite junior tennis players in the UK. The participants included 7 males and 1 female and were aged between 23 and 36 years. The participants worked in the following areas; Scotland (1), Northern England (3), Midlands (1), Southern England (2), and Wales (1). The less experienced coaches had 1 – 4 years coaching experience with elite juniors (Flett et al., 2012). Participants were currently working with elite junior tennis players and held level 4 or 5 LTA coaching qualifications. Junior tennis players were aged between 11 – 18 years old, corresponding with the LTA yellow ball competition system. Junior elite was defined as competing at national level competition and above (Rees et al., 2016). The interviews in this study were semi-structured and the aim was to understand what it was like for participants to coach elite junior tennis players. Interviews lasted between 1.5 and 3.5 hours and were audio recorded. Interviews were transcribed verbatim, printed out, and analysed by following the procedure for IPA.

RESULTS

The results show that: (a) self-employment makes coaching competitive; (b) less experienced coaches were surprised by the nature of parental interactions; and, (c) less experienced coaches struggled to cope with the reality of coaching and this triggered disillusionment with coaching.

Self-employment makes coaching competitive.

The participants found the coaching environment challenging and they described self-employment as an issue that made coaching competitive. Self-employment gave coaches the freedom to work with whomever they wanted and pick the times they worked but also created difficulties with how they interacted with other coaches. Amy described self-employment making coaches competitive:

"A lot of coaches are self-employed, if they were employed then maybe they'd be on the same page more. It's full of ego and one-up-man-ship because they are self-employed… That's how ego and things get out of control, because you are worried about yourself and your income."

Competition between coaches was a consistent theme and self-employment appeared to drive much of this competitiveness. Phil said: "I think they (coaches) feel that instead of having the kids interests at heart, the whole thing can become a competition (between coaches). Everyone is fighting for business".

One could assume that being self-employed requires individuals to view others as competition. Participants were struggling to cope with the nature of self-employment and balance this with seeking help from other coaches. Peter said: "I'd love to be able to go to another centre and talk about my players. But if they (another coach) gave me a solution that worked then they'd want the credit, or they'd want my player". Self-employment meant the participants saw other coaches as rivals.

Supporting a cohesive coaching community was challenging for the participants because other coaches were threats to their income. Nathan said "you can't talk to other coaches about your issues because you lose face. They (other coaches) are your competition, aren't they?" Self-employment continued to influence the participants behaviours towards other coaches and created untrusting attitudes towards other coaches.

Less experienced coaches were surprised by the nature of parental interactions.

There was evidence to suggest that the participants were surprised by the nature of their interactions with parents of the players they taught. When discussing parental interactions participants regularly described conflict. For example, Josh said: "Do parents feel less inclined to criticise older coaches, because they are older than the parents, or because they're a national coach and they want something from them? I want to say, 'who the hell do you think you are' to these parents".

Unsurprisingly, parents are an important part of tennis coaches' realities because they are the ones that bring their children to training. The participants consistently expressed surprise at the nature of interactions with parents. Nathan said: "Why do parents get so much of a voice in tennis, because in other sports they don't? Tennis is the sport that parents feel like they can just say I'm not happy with you". The lack of experience that the participants had with parent interactions could mean that they were uncomfortable with such interactions and that these experiences cause the coaches uncertainty.

Participants described parent's attitudes as extremes on a continuum, either very positive or very negative. Josh said "when a player wins, the parents are really happy. When a player loses, my coaching is rubbish". Participants continuously described parents as difficult to satisfy or wanting instant results and this created uncertainty for participants as they did not feel able to sustain positive results and keep parents happy.

Less experienced coaches struggled to cope with the reality of coaching which can lead to disillusionment with coaching.

The participants were uncomfortable with the coaching environment and there were signs early in their careers that they were questioning their involvement. For example, Josh said: "I really can't see myself doing it (coaching) past 30-35. I might have gone mad by then! Hopefully I produce a player and go on tour with them and leave these parents and this moaning behind".

The primary concern for the participants remained competition and parental conflict. With less than 4 years coaching experience in the elite context, the participants seemed ill equipped to cope effectively with their experiences. Nathan said: The tennis coaching world is a funny one. Everyone (parents and coaches) hates each other! So much aggro and people hawking (stealing) players off each other. Bitching parents, backstabbing coaches. Jesus it's hard work".

The challenges of tennis coaching were having a negative effect on the participants job satisfaction and this resulted in them questioning whether they wanted to continue as coaches. Phil said: "It's not as good a job as when you first go into it, I think. That's the worrying thing. How many coaches are there like me saying the same thing? I don't like it (coaching) anymore. There must be loads (of coaches saying this)".

Coping strategies are an important factor in all professionals' working lives so they can sustain their mental state in the face of challenges. Coping Strategies take time to develop (Thelwell et al., 2010; Kelly et al., 2018) and the participants in this study were struggling to cope effectively with their challenges, causing issues with job satisfaction and motivation to coach.

Discussion

The data in this study highlights several issues that less experienced tennis coaches face in their day-to-day activities.

Firstly, this study highlighted self-employment as a significant factor in participants' opinions of other tennis coaches and was associated with distrusting of other coaches. Participants described negative attitudes towards other coaches, and this was generally associated with self-employment. Participants feared having less favourable reputations than other coaches because it could directly affect their income (Cassidy et al., 2016).

Secondly, participants described intolerant attitudes towards parental involvement in elite tennis. Parent interactions are a coaching stressor (Knight & Harwood, 2009) and this study shows untrusting attitudes towards parents. Participants described avoidance of parent interaction and highlighted discomfort with parental involvement.

Thirdly, the participants were insecure about their coaching experiences and described demotivation when they were unable to cope with their experiences. Less experienced coaches described inner-conflicts with job satisfaction, and this had a negative effect on their motivation to remain as tennis coaches (Kelchtermans; 2009a; 2009b).

CONCLUSION

The findings suggest that less experienced coaches require emotional support early in their coaching careers. Bandura said, "It is difficult to achieve much while fighting self-doubt" (1997, p. 118) and there was evidence throughout this study that participants were doubting themselves. The findings support assertions that coach education could use insights of experienced coaches more effectively to prepare new practitioners for their roles (Cushion, Jones & Armour, 2003). Participants were anxious about challenges that they faced in their day-to-day activities, and their anxieties had a negative effect on their motivation to coach (Bleach, 2019).

Educating new coaches about the coping mechanisms used by experienced practitioners would help to: (a) raise awareness that coaches will experience emotional challenges in their careers; and, (b) enable new coaches to select coping strategies that have worked for other coaches.

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RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

The transition to the yellow ball in tennis coaching

Caio Corrêa Cortela (BRA), Juan Pedro Fuentes García (ESP), Michael Davis Higuera (GBR) & Layla Maria Campos Aburachid (BRA)

ITF Coaching and Sport Science Review 2019; 79 (27): 22-24

ABSTRACT

More than 10 years have passed since Play and Stay campaign was launched; however, there is a lack of scientific study focusing on the transition process between the stages that make up Tennis 10s. So, on the basis of interviews with expert tennis coordinators responsible for sport initiation programmes in Brazilian clubs, this study tries to describe the strategies used for the transition between the "green ball" and the "yellow ball".

Key words: tennis, sport initiation, competition, Tennis 10s.

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INTRODUCTION

The use of low pressure yellow balls is considered by the International Tennis Federation as a key aspect in the sport initiation / grassroots level of the game (Miley, 2010). According to Newman (2010), the slower balls provide more time for player response, facilitate the learner´s return and help to develop and adopt more advanced tactical-technical patterns which are used in competitive tennis and will be useful in the future to reach the top levels of performance.

Studies that involve adapted materials have provided favourable evidence for the use of structural adaptations in children´s tennis (Buszard et al., 2016). In situations of shot tests, Buszard et al. (2014), reported a positive impact on the performance of the forehand in those kids who were using equipment and balls adapted to their age groups when compared to those using conventional materials, showing greater efficiency and efficacy in stroke performance as well as and movement patterns. Likewise, Larson & Guggenheimer (2013) described tennis players whose strokes were tested in adapted conditions (orange stage) compared with the results using conventional courts and balls, and the results were significantly better, hitting with greater speed and accuracy and with a higher degree of efficacy.

With regard to learning situations, Farrow & Reid (2010) reported similar results to those observed during the aforementioned tests, confirming that the kids exposed to adult playing conditions had fewer learning opportunities, hit fewer balls per training session, were less successful in stroke production and were less motivated to continue playing tennis.

During matches and/or competitions, it was shown that constraints derived from the use of adapted material had a positive effect on players´ behaviour. In this way, Fitzpatrick et al. (2017) showed that matches played in adapted conditions (Red and Orange Stage) favoured longer rallies. Schmidhofer et al. (2014) declared that matches played in Orange Stage of Tennis 10s, were the closest to professional tennis in the number of points won at the net and the rhythm of stroke execution. Kachel et al. (2014) said that the use of the green balls, instead of yellow balls, encouraged changes in the playing patterns adopted by kids, and made them more aggressive when using the green balls, i.e. going to the net more, rallying with faster strokes and hitting more strokes inside their comfort zone.

In spite of the increasing research to understand the impact of structural and methodological adaptations in kids' learning/ training processes, little is known about the influence of practice structures and the use of adapted materials in the progression for kids between the different stages of Tennis 10s (Buszard et al., 2018).

According to the constraint-based approach, when adapting the equipment of the game, the interaction of three types of factors or constraints (individual, environmental and task) changes and, thus, the action and the potential for action change as well (Davids et al., 2008). In this case, using slower and lower bouncing balls, children can adapt their techniques and tactics to conform with their skills and capabilities by means of a divergent discovery or learning process. This acts as a starting point to understand when to move from one Tennis 10s stage to the next one. Players could move to the next Tennis 10s phase when: their capabilities let them start learning or executing skills that represent the competitive level of the game; or, when they already know the patterns and/or can execute them as if they had a playing style similar to that of the competitive level. This would all suggest that the players are already competent in the previous level.

Thus, the transition in the ball use is a key point in the sport initiation process, especially when passing from the Green ball (25% slower) to the Yellow ball. A bad transition at this stage would put the work of the previous stages at risk, producing unwanted adaptations in the basic tactical/ technical fundamentals. Considering the obvious desire to avoid the above scenario, the aim of this study has been to describe the transition process from the Green ball to the Yellow ball in Brazilian clubs.

METHODS

The sample for this study consisted of 14 coordinators from Brazilian clubs with prestigious reputations in sport initiation tennis player development. The professionals that were interviewed had previous experience coaching regional level (7), national level (4) and international level (3) tennis players, and had an average coaching experience of 23,8 ± 11,8 years.

At the time of gathering data, the clubs analysed had 2,980 students involved in tennis initiation / grassroots programmes (not introduced to the use of the yellow ball yet). Most programmes started with kids of approximately 5 years old, and finished the participation in Green Stage at the age of 10.

Categorization of the findings was conducted through Sparkes and Smith's (2014) "thematic analysis", considering for analysis and discussion all the topics that three or more coordinators mentioned.

FINDINGS AND DISCUSSION

In table 1, we present the only category in which at least three coordinators reached consensus.

Table 1. Strategies for the transition from the green to the yellow ball.

Coordinators	Category
(U6; U12;U13)	Using the green and the yellow balls simultaneously in the sessions.

[...] coaches use them [the yellow balls] more often towards the end of the year. Coaches start using the balls, mixing them. [...] from the end of September. In January, they will be playing [only yellow balls]. (S12 – 70'52").

Although some coordinators adopted a specific procedure for the transition, it was impossible to identify clearly that their transition process had happened in a systematic and empirical way, there not being well-defined criteria for the process (time of intervention, time of use destined to using each type of ball in the session, structure of the practice...)

[...] I think it has to be natural. The main point coaches have expressed is that the coach has to observe and be very alert with this change. I don't have a very organized process for this yet, I cannot say "we have a system, we are doing it this way"- that does not exist so far. What we do have today is a process.... In fact, it consists of a differentiated level of attention to those kids in the transition stage; mainly on the grip and the height of the impact point. (S5 - 47'28").

The "clinical eye" of the coach seems to be the main parameter in determining how and how fast to make the transition. According to the coordinators, the height of the impact point of the racket and the ball and the grip used were the reference criteria for the coach to observe. These two factors are precisely the most impacted by the use of the Green ball, which according to Kachel et al. (2015) and Newman (2010), and on the basis of the constraints based theory (Davids et al., 2008), enable impact points that are much more appropriate for kids, due to the material the balls are made of and their compression, which allows the optimization of the adaptation of the action to the height of the children in this stage.

Just as expressed by Buszard et al. (2018), it has been shown that competition plays an important role at the beginning of the transition between balls/stages. Four coordinators stated that this process started some months before the end of the current competition year, so it was possible for children to adapt and compete with the yellow ball in the summer tours at the beginning of the new season. "The Guga Cup", one of the most important competitions in the country, was mentioned by two coordinators as being the last one with adapted balls and the beginning of the transition process towards the yellow ball.

These findings strengthen the role of the competitive system in training programmes, from the first stages of sport preparation to the long term (Gonçalves et al., 2016). Thus, it is necessary to analyse the inherent pros and cons of extending the use of the Green ball regularly in competitions for older age groups. This modification could reduce the impact of the transition, particularly regarding the contact point and grip change, depending on when the height and strength of the players increase.

CONCLUSIONS

Given the lack of research about transition between stages in ITF Tennis 10s, we suggest basing future studies on the impact of the different practice conditions, especially in the combinations of different materials (green and yellow balls) and through variability in practice using different instruments, implements and materials (weight, size, textures...). All of the above may help obtain the best learning results in acquisition, retention and transference in transition phase.

Given the identification of the coach´s "clinical eye" and the importance of certain playing factors like grip and height of the impact point for the transition to the next stage, and given an understanding of the constraint based approach, we find it important to start analysing systematically all the factors that may serve to predict good performance in the next stage, so as to set guidelines for the transition between stages not based on age but on capability. This could result in a better participation and skill acquisition rate and a lower rate of dropping out at developing ages.

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The influence of non-verbal body language on sport performance in professional tennis

Rafael Martínez-Gallego & David Carrillo Molina (ESP)

ITF Coaching and Sport Science Review 2019; 79 (27): 25-27

ABSTRACT

The main objective of this study was to analyse the relationship between players´ non-verbal body language and their performance in sport. The sample consists of a total of 477 actions from 40 players competing in the ATP Tour. All actions were taken from tie-breaks in official tournaments. The categories that were analyzed were previous performance, dominant non-verbal body language, submissive non-verbal body language, and performance later on. Results show how the players´ non verbal body language impacts on their performance later on. Thus, we can conclude that following dominant non-verbal body language, the probabilities of better performance in the next point are greater than following submissive non-verbal body language. Therefore, it is important to train these aspects as an extra tool to improve players´ performance.

Key words: non verbal body language, performance, tennis, analysis

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INTRODUCTION

Body language or non verbal body language (NVB) had not been deeply studied until a few years ago, in spite of its importance for sport in general, and for tennis in particular. In fact, authors like Furley, Dicks & Memmert (2012) state that it is surprising that until not long ago research had neglected the analysis of non-verbal body language in sporting contexts.

Motos (cited in Lara & Moral, 2008) conclude that elementary communication takes place through verbal language, but body language relates with the latter, confirming or denying its message. He adds that between 50-65% of the information transmitted in a message is body coded. Thus, it confirms the existence and validation of a specialized non-verbal language in sport (Vallejo et al., 2004).

The main conclusions of relevant research in this area, expressing the importance of body language in sport, are presented below.

Lara & Moral (2008) analysed communication through behaviour and the use of the body by 12 top level female volleyball players. The main conclusion drawn was that after winning a point, there is a feeling of joy, and players do not mind sharing that with the others, but, after losing a point there is a feeling which is closer to sadness and they prefer not to communicate it. Therefore, it has been demonstrated that there exists a kind of body language (non-verbal body language) when losing a point, and a different one when winning a point. These authors state that when the point is lost, players bow their heads with a passive expression in their faces and with asymmetric and closed body forms, in a way that usually expresses anger and rage which last for a short time since they quickly try to forget.

On the other hand, when players win the point, their head position is up, the head is raised, the trunk is straight and open and a symmetrical body forms to express joy. Energetic, quick and intense movements last longer. Finally, these authors come to the relevant conclusion that most of the time, this body language is unconscious.

Accordng to Buscombe, Greenlees, Holder, Thelwell & Rimmer (2006), tennis players cause initial impressions on their opponents during warm-up on the bases of their opponent´s body language, which impacts on their level of confidence.

On the other hand, Furley et al. (2012) analysed body language in football penalty shots and came to the conclusion that goal keepers had a more positive impression than those players whose body language is submissive, that is to say, they were more confident on the possibilities of stopping the penalty against players whose body language was meek, compared to players whose body language was dominant.

Furley y Dicks (2012) in their research with amateur baseball players in Germany concluded that athletes should be advised to avoid expressing or showing submissive body language, since it can instil confidence in the opponent, and therefore give them a sporting performance.

Greenlees, Buscombe, Thelwell, Holder & Rimmer (2005) analysed the impact of body language, watching videos in which tennis players were warming up. Their main conclusion was that tennis players expect a better performance against those whose body language is negative, in contrast to those whose body language is positive.

This research also concludes that athletes can gain an advantage over their opponents by using an appropriate body language. Therefore, coaches and sport psychologists should develop techniques to improve athletes´ body language.

It should be noted that body language analysis is closely related to sport performance. In spite of this, there is very little information regarding elite tennis. Thus, this study analyses the relationship between body language between points and its relationship with the performance in the previous and the following points.

METHOD

The sample consists of 477 actions from 40 ATP Tour players, who, at the time of the research were ranked between 1 and 382 in the ATP Tour. All actions were taken from tie-breaks in official tournaments between 2010 and 2018.

Variables analyzed

The variables analyzed were classified into five categories, and in each category we identified more specific actions or behaviours. These categories and actions are:

- Dominant NVB: upright with good posture, head up and 90% of the time looking at the opponent.
- Submissive NVB: hunched posture, shrunken body, shoulders forward and eyes looking down.
- PRE-Performance: good own action, good opponent action, bad own action, bad opponent action and performance does not change.
- POST-Performance: good own action, good opponent action, bad own action, bad opponent action and performance does not change.

Statistical analysis

The statistical analysis was performed using SPSS statistic pack, version 21. The Kolmogorov Smirnov test was performed to test the normality of data in each variable, and in all variables a significance level of less than 0.05 was obtained which indicates that the distribution was not normal, therefore, we used non-parametric tests. The Chi squared test was conducted, in order to investigate if a relationship existed between the different variables analyzed, and to check if there were significant differences in these variables.

FINDINGS AND DISCUSSION

Predominant NVB

The predominant NVB in top tennis competition is submissive, representing 56.71% of the total actions analysed, while the dominant represents 43.29% of all actions.

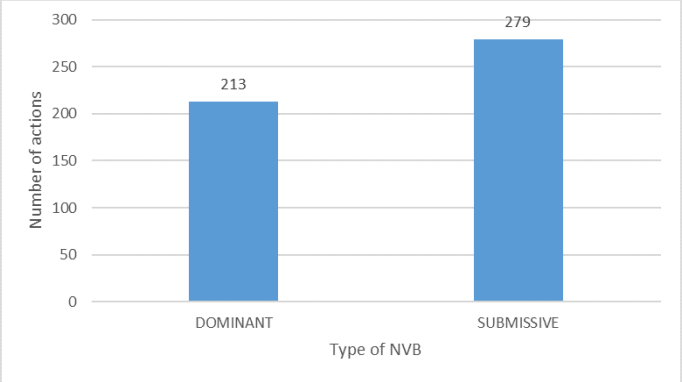

Figure 1. Frequency of dominant and submissive NVB

Relationship between previous performance and non-verbal body language of players

With regard to the relationship between the previous performance and the non-verbal body language type, Table 1 shows that there is no relationship between performance in the previous point, either succeeding (good own action) or failing (bad own action) ($p>0.05$), and the non-verbal body language or body language that will be expressed later, once the action is finished. Therefore, it is possible to conclude that previous performance does not impact on the body language of professional players.

Table 1.Relationship between pre-performance actions and NVB variables

	Submissive NVB	Dominant NVB
Positive action	62.9%	66.34%
Negative action	37.1&	33.66%
x^2=0,293; p=0,588		

Relationship between post-performance and non-verbal body language of the players

As Table 2 shows, there is a correlation between the post-performance and non-verbal body language ($p<0,05$). This means that verbal language has a clear impact on the post-performance of the player. Therefore, given a submissive NVB, there will be a greater probability of negative performance and vice versa.

Table 2. Relationship between post-performance and NVB variables.

	Submissive NVB	Dominant NVB
Positive action	46.3 %	53.7 %
Negative action	87.9 %	12.1 %
x^2=73,27; p<0,001		

CONCLUSIONS

- No relationship has been found between previous performance and non verbal body language (NVB).
- There is a relationship between non-verbal body language and post-performance. When there is a show of submissive NVB, it is followed by a greater number of negative actions later, but when there is a show of dominant NVB, it is followed by a greater number of positive actions.

COACHING IMPLICATIONS

Given the aforementioned conclusions, the following plan for coaching dominant NVB is proposed in order to foster dominant non-verbal behaviours that favour enhanced sport performance.

Week 1	Week 2	Week 3	Week 4
Visualisation	Routine training (analytically)	Routine training (analytically)	Service task
Choice of routine (Consensus)			Between serves, perform a routine
ROUTINE			
After finishing the point:			
-Accept the result			
-Approach your towel and dry off whilst controlling breathing			
-Get back to my serve or return position			
-Grip the racket securely and with confidence			
-Hit the ball well			
Week 5	Week 6	Week 7	Week 8
Routine training (analytically)	Play a match only with forehands	Play a tie-break	Match to 4 games
	Perform routine when I win a point	Perform routine after every point	Perform routine after every point

Figure 2. Summary of the Dominant NVB coaching proposal

Graphic 4 shows the breakdown of the NVB coaching plan. There is a progression over time, starting with self-analysis of behaviours and ending up with the introduction of specific routines, that is to say, more global work, i.e. match routines. The length of the coaching proposal is two months, putting aside 20 minutes per day, three days a week, during coaching sessions.

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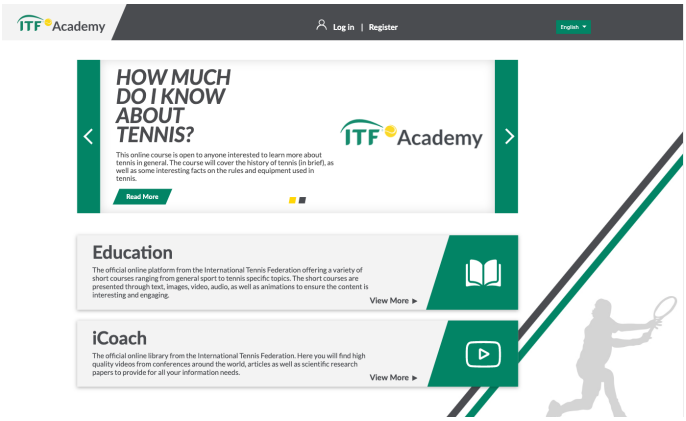

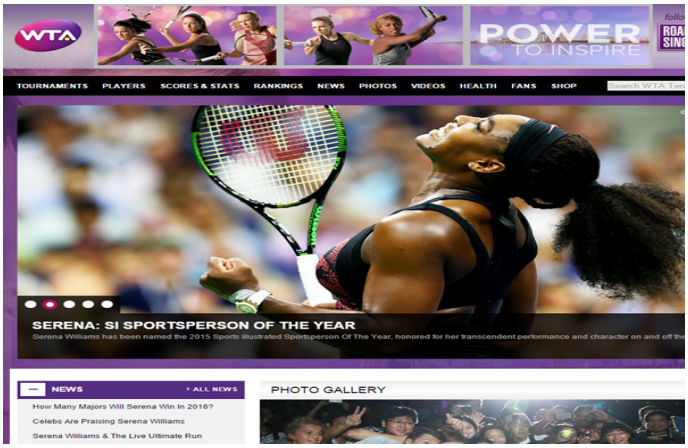

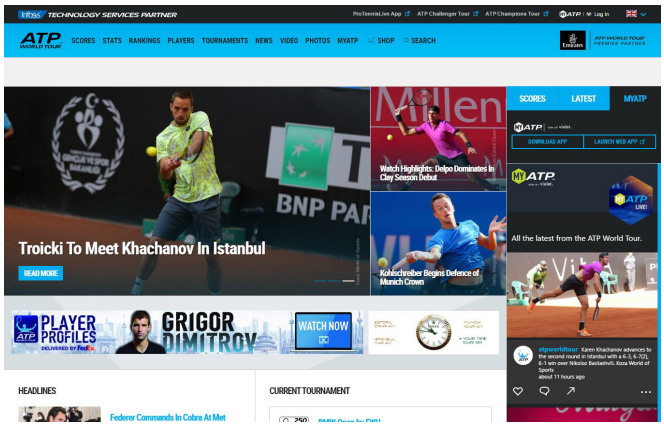

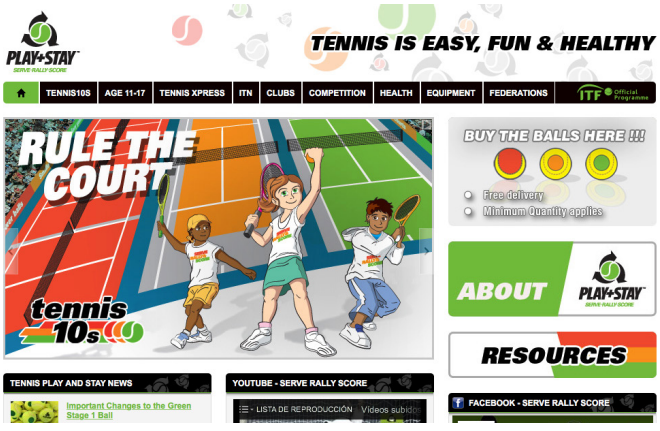

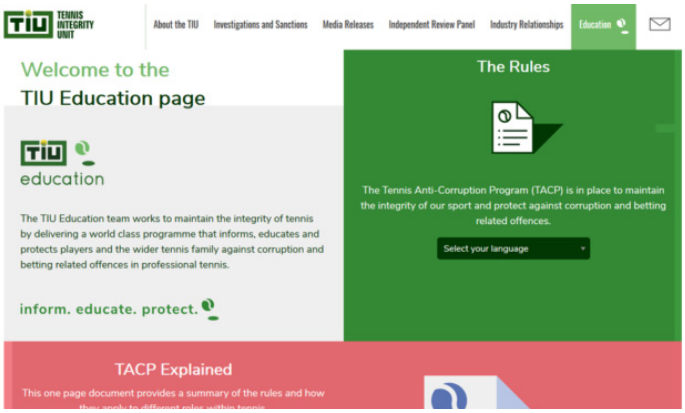

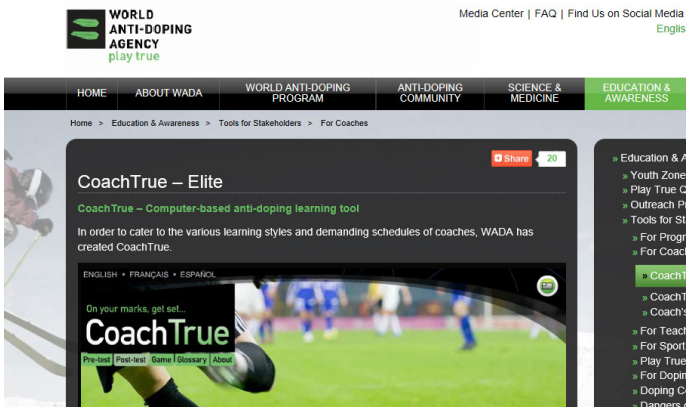

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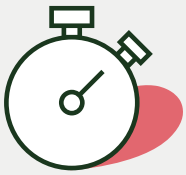

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