COACHING & SPORT SCIENCE REVIEW

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CONTENTS ISSUE 62

International Tennis Federation

COACHING & SPORT SCIENCE REVIEW

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

EDITORIAL

Welcome to issue 62 of the ITF Coaching and Sport Science Review which is the first issue of 2014. It looks to be yet another exciting year in the world of tennis. Articles in this issue range from the analysis of men's and women's tennis to mental toughness and tennis specific fitness exercises. The authors of the articles in this issue bring a wealth of experience both as players and as coaches.

March saw the celebration of the annual World Tennis Day, a highly successful event marked in over 90 nations worldwide. It was encouraging to see so many venues supporting the ITF's bid to promote tennis and participation around the world. The event brought back some of tennis' greatest rivalries as the likes of Sampras and Agassi took to the court in London, with Murray playing Djokovic in New York. Action was seen across the globe with Tennis10s initiatives being showcased in many nations including Argentina, Kenya and New Zealand.

This year the ITF will be hosting the biannual Regional Coaching Conferences. The Conferences, sponsored by BNP Paribas, form an important part of the ITF's Coach Education Programme. This year the conferences will host a range of topics from high performance training to increasing participation by attracting new players of all levels and will feature some of the top international speakers who will present some of the latest information related to the physical, tactical, technical and psychological elements of the game.

The confirmed dates for the ITF Regional Coaches Conferences by BNP Paribas so far are as follow:

24 - 27 September ITF/OS Southern African Regional Coaches Conference by BNP Paribas - South Africa

2 - 5 October ITF/OS Asian Regional Coaches Conference by BNP Paribas - China

18 - 21 October ITF/OS Central American Regional Coaches Conference by BNP Paribas - Nicaragua

22 - 25 October Tennis Europe/OS Coaches Conference - Estonia

Coaches who are interested in attending the conference in their region should approach their National Associations who will be receiving information in regards to the upcoming conferences shortly. Confirmation on the dates and venues in North Africa, South America and Caribbean will follow shortly and full details will be available on www.itftennis.com/coaching in the coming months.

Tennis iCoach, the online tennis distance learning platform of the ITF continues to showcase presentations from the 18th Worldwide Coaches Conference by BNP Paribas, which was held in Cancún, Mexico last November. Presentations have now been published in English and Spanish from Judy Murray, Jim Loehr, Nick Bollettieri and other experts. To see the new video tour of Tennis iCoach, click here

The latest version Tennis iCoach has a vibrant new look and feel, with a more user friendly interface and simplified navigation. The site boasts powerful search filters to easily allow coaches, parents and players to access content that is relevant to them, from a library of over 1500 educational articles, videos and conferences.

This edition of the ITF Coaching and Sport Science review was edited and compiled by Tom Sutton who has been working win the ITF's coach education team for the past 18 months and has done a great job especially with co-ordinating the speakers and their requirements at the Worldwide Coaches Conference in Mexico. Tom has recently left his position at the ITF to take on a role at the upcoming Commonwealth Games. Tom has been a true asset to the Coaching Team at the ITF and we are very sorry to lose him from the team but we would like to wish him every success in the future and good luck in his new position.

We would like to thank you as one of our valued readers. We hope that you enjoy issue 62 of the ITF Coaching and Sport Science review.

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Men's tennis vs Women's tennis

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ITF Coaching and Sport Science Review 2014; 62 (22): 3 - 5

ABSTRACT

Data from men's and women's singles at the four Grand Slam events are presented to quantify differences between men's tennis and women's tennis. The most obvious difference is the serve speed, but there are also differences in all other aspects of the game including the number of aces, double faults, unforced errors, winners, tiebreak sets, games per set and points per game.

Key words: tennis, serve speed, statistics, Grand Slam

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Article accepted: 28 January 2014

INTRODUCTION

Men's tennis differs from women's tennis, as in many other sports, due to the fact that men are generally taller, stronger and faster. In order to quantify the differences, I examined the statistics published on the tournament web sites for each of the four Grand Slam events from 2002 to 2013. Data for men have been analysed previously by Cross and Pollard (2009, 2011). To analyse average serve speeds for women, I collected individual match data from the 2008 US Open and Wimbledon events, and the 2009 Australian and French Open events, including all 31 matches from round 3 to the final. For men serve speeds, I collected data from the 2008 US Open, and the 2009 Australian, French and Wimbledon events, including all 127 matches from round 1 to the final. In addition, I collected most of the overall event summaries for men and women from 2002 to 2013, although some of that data has been omitted from the summaries in this paper since some of the data appears to be inconsistent. Mistakes are sometimes made when collecting or recording the data. Serve speeds are not recorded on every court, the number of unforced errors is not shown in the French Open Event table, and winners are not always recorded or counted for every match.

SERVE SPEEDS

The average serve speeds of match winners is slightly higher than the average serve speeds of match losers, but only by 2 or 3 km/hr in general. Consequently, I have quoted in Table 1 the average speeds for all players in all matches for which serve speeds were collected, including both match winners and match losers. Players advancing from one round to the next are counted more than once in the match averages. Averaged over all four events, the average first serve speed for men is 184.1 km/hr and for women is 158.5 km/hr. The average second serve speed for men is 150.4 km/hr and for women is 133.4 km/hr. On average, the first serve speed for men is 25.6 km/hr faster than for women, and the average 2nd serve speed is 17.0 km/hr faster.

EVENT	AUS 2009		FRE 2009		WIM 2009		US 2009	
	M	W	M	W	M	W	M	W
N	164	62	184	62	150	62	156	60
V2 km/hr	182.3	156.8	185.0	156.8	186.6	161.9	182.5	158.4
V2 km/hr	148.0	132.0	150.0	133.7	155.3	136.8	148.3	131.0

Table 1. Average first (V1) and second (V2) speeds averaged over N players.

A different comparison of serve speeds can be made using the serve speed rankings provided on the web for each Grand Slam event. The top 20 players are listed in order of maximum serve speed, rather than average serve speed. Results for 2013 are shown in Table 2 by taking the average top serve speed of all 20 ranked players. Averaged over all four events, the average top serve speed for men is 218.6 km/hr and for women is 185.6 km/hr, a difference of 33 km/hr.

EVENT	AUS 2009		FRE 2009		WIM 2009		US 2009	
	M	W	M	W	M	W	M	W
N	20	20	20	20	20	20	20	20
Vmax km/hr	219.3	185.9	217.9	184.3	217.5	185.3	219.9	186.9

Table 2. Maximum serve speeds, in km/hr, averaged over the top 20 players in 2013.

ACES AND DOUBLE FAULTS

It is not surprising that men serve more aces and fewer double faults than women. In addition, men serve about twice as many aces as double faults, while women serve about twice as many double faults as aces (Wimbledon being an exception). The results for each Grand Slam event are shown in Fig. 1. The results are shown as points per ace and points per double fault and were calculated from the total number of points, aces and double faults at each event, summed over all seven rounds up to and including the final. For example, at the Australian Open, one in every 13 points on average (approximately) is won with an ace for men. For women, one in every 30 or so points is won with an ace. Also at the Australian Open, men lose one in every 30 points on average by serving a double fault, while women lose one point in 18 by serving a double fault. It is easier for both men and women to serve an ace at Wimbledon, and harder to serve at ace at the French Open.

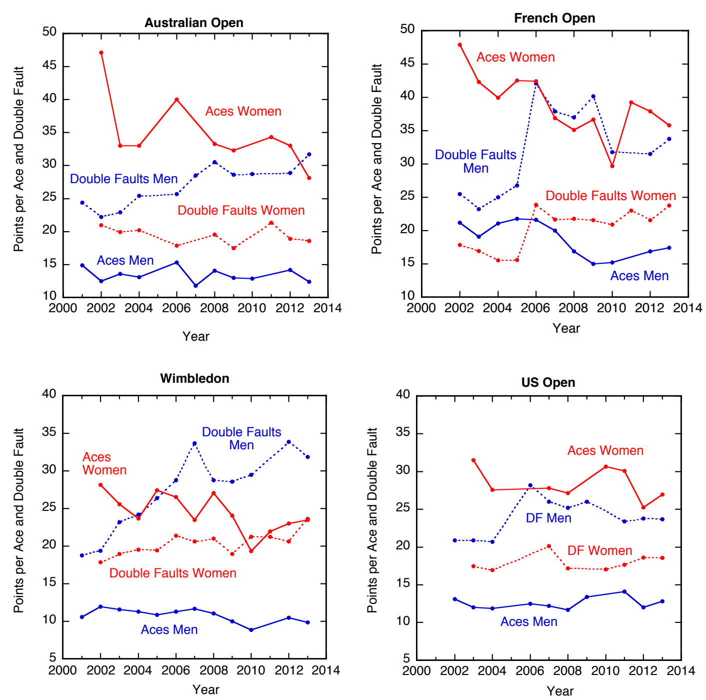

Figure 1. Points per ace and points per double fault.

TIEBREAK SETS

Figure 2 shows the total number of sets divided by the total number of tiebreak sets at each Grand Slam event. At the Australian Open, roughly every 7th set on average is a tiebreak set for men, and roughly every 13th set is a tiebreak set for women. The main difference between the four events is that there are more tiebreak sets at Wimbledon for the men, but not for the women.

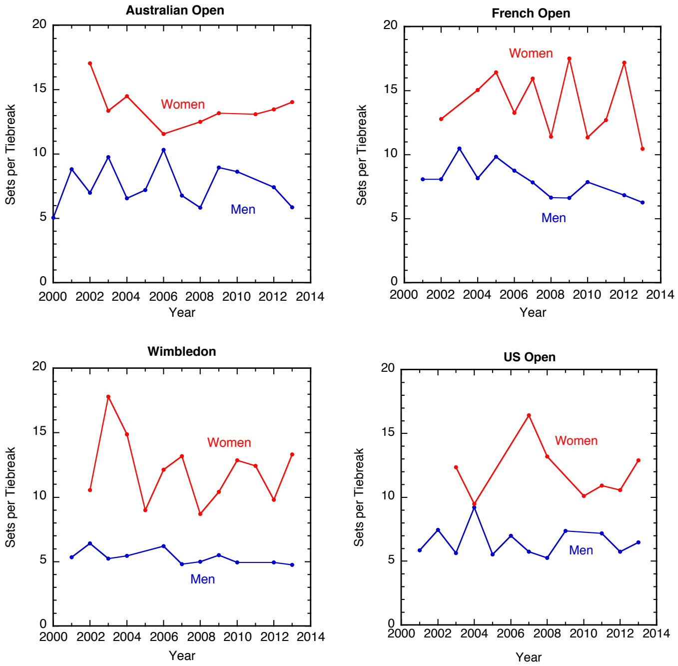

Figure 2. Sets per tiebreak set.

POINTS PER GAME AND GAMES PER SET

Figure 3 shows the average number of points per game and the average number of games per set at each Grand Slam event. At all four events, there are about 6.3 points per game on average for men and about 6.6 points per game on average for women. The minimum number of points in a game is four. The average number of games in a set is about 10 for men and about 9 for women. The latter result is surprising, since men require fewer points to win a game than women, but they require more games to win a set. The essential reason is that men have faster serves so they win games more easily, but so do their opponents.

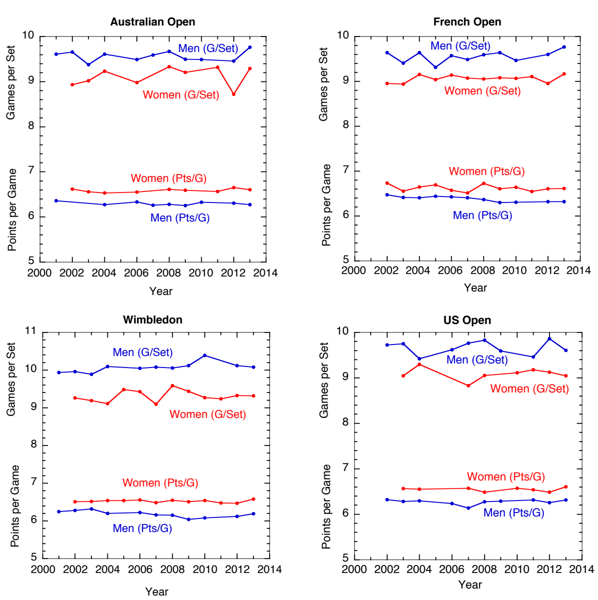

Figure 3. Points per game and games per set.

SERVE BREAKS

Since men serve faster than women, men tend to win their serve more easily. A serve break for men is therefore a more significant result. Figure 4 shows the total number of games in each Grand Slam event divided by the total number of games that resulted in a serve break. On average, there is a break of serve roughly every fifth game in men's tennis, and roughly every third game in women's tennis, depending on the actual event.

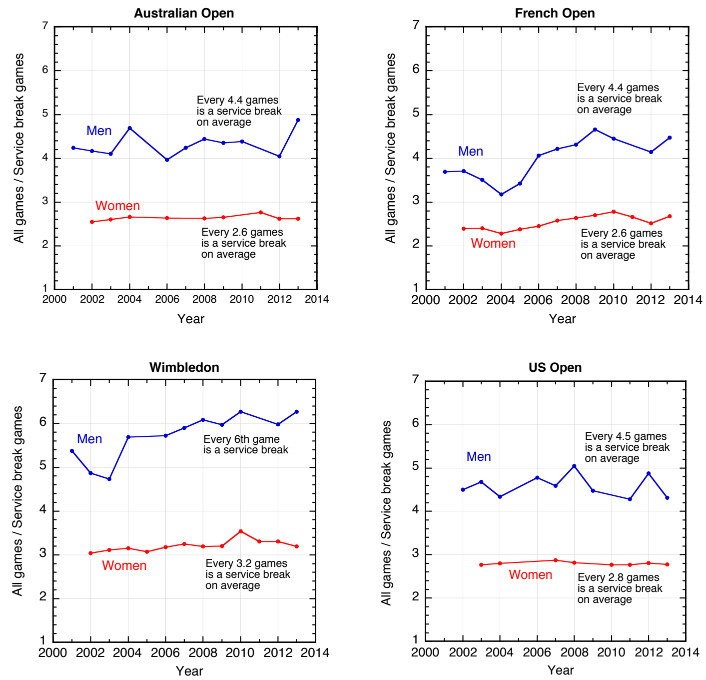

Figure 4. Ratio of total games to serve break games at each Grand Slam event.

SERVE GAMES WON

Figure 5 shows the percentage of serve games won by men and women at each Grand Slam event. Men win about 80% of their serve games, and women win about 65% of their serve games, the figures being slightly higher at Wimbledon.

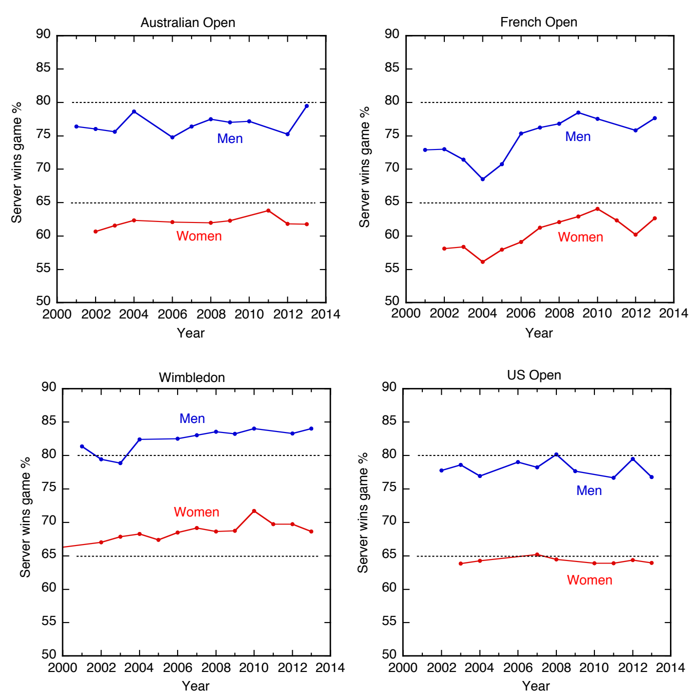

Figure 5. Percentage of service games won by server, 2000-2013. Men win about 80% of their serve games on average, and women win about 65% of their serve games.

WINNERS

Figure 6 shows the average number of points per winner. Data for the French Open are inconsistent and are not included. The results show that women hit fewer winners than men, although the difference is not as pronounced as it is for service aces. It is perhaps surprising that at the men's event at Wimbledon in 2010, every second point on average was won with a winner. There were 30,251 points played, and 15,157 winners were recorded. Usually, about 10,000 winners are recorded for the men's singles event at Wimbledon. It is possible that the definition of a winner was changed in that year since there was a similar unusual increase in the number of winners for the women in 2010.

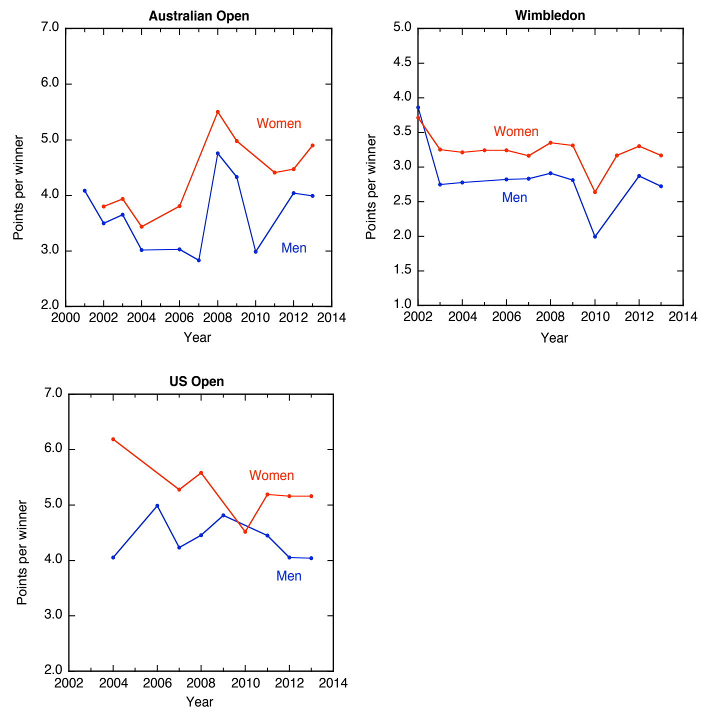

Figure. 6 Points per winner.

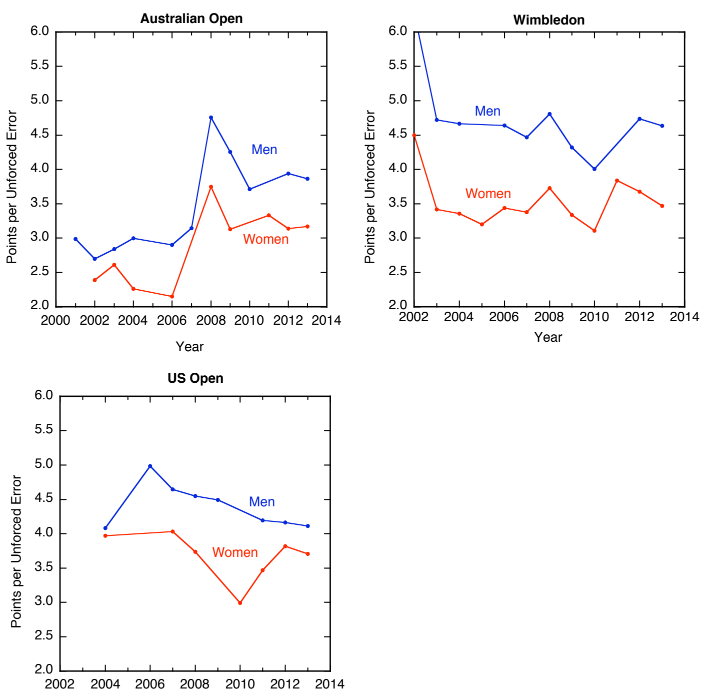

Figure 7. Points per unforced error.

UNFORCED ERRORS

Figure 7 shows the average number of points per unforced error. Unforced errors are not reported for the French Open. The results show that men make fewer unforced errors, approximately one unforced error every four points, compared with about one unforced error every 3.5 points for women.

CONCLUSIONS

No case is made in this paper that men's tennis is better or more or less interesting than women's tennis or even mixed tennis. The evidence presented shows that men's tennis is measurably different from women's tennis in almost every respect. The differences can be attributed to different physical characteristics of men and women, allowing men to serve and run faster than women. Coaches who recognise and who can quantify those differences should be able to make better decisions when advising their students.

REFERENCES

Cross R & Pollard G (2009). Grand Slam men's singles tennis 1991-2009 serve speeds and other related data, ITF Coaching and Sport Science Review 49, 8-10.

Cross R & Pollard G (2011). Grand Slam mens singles tennis 1995-2009. Part 2: Points, games and sets 53, 3-6.

RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

TennisiCoach

Analyzing Wimbledon

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ITF Coaching and Sport Science Review 2014; 62 (22): 6 - 7

ABSTRACT

This paper highlights some of the topics discussed in our recently published book 'Analyzing Wimbledon', which provides a statistical analysis of many topics relevant for tennis players, coaches, commentators, and spectators.

Key words: commentators, prediction, service strategy, winning mood, statistics

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INTRODUCTION

This paper introduces and summarizes our recently published book, entitled Analyzing Wimbledon. In this book we study commentators' wisdoms, which are of interest to tennis fans, players, and statisticians. The book contains the results of more than fifteen years of research, using data on 100,000 points played in the men's and women's singles at Wimbledon and data of other grand slam tournaments. The book also discusses how the outcome of a match can be predicted (also while the match is in progress), which points are important and which are not, how to choose an optimal service strategy, and how tennis results can be used to better understand human behavior in general. The book uses tennis as a vehicle to illustrate the power and beauty of statistical reasoning.

COMMENTATORS' WISDOMS

Suppose you are watching a tennis match between Novak Djokovic and Rafael Nadal. The commentator says: 'Djokovic serves first in the set, so he has an advantage'. Why would this be the case? Perhaps because he is then 'always' one game ahead, thus serving under less pressure. But does it actually influence him and, if so, how? Now we come to the seventh game, according to some the most important game of the set. But is it? Nadal serves an ace at breakpoint down (30-40). Of course! Real champions win the big points. But they win most points on service anyway, including the unimportant points. Do the real champions over-perform on big points or do weaker players underperform, so that it only seems that the champions over-perform? (The latter is the case.) Then Nadal wins three consecutive games. He is in a winning mood, the momentum is on his side. But does a 'winning mood' actually exist in tennis? (It does, but it is smaller than many expect.)

An Example

Let us consider some concrete examples. To study the serving-first advantage we first use data on more than one thousand sets played at Wimbledon and calculate how often the player who served first also won the set. This statistic shows that for the men there is a slight advantage in the first set, but no advantage in the other sets. On the contrary, in the other sets there is a disadvantage: the player who serves first in the set is more likely to lose the set than to win it. This is surprising. What could be the explanation? Perhaps it is different for the women? But no, the same pattern occurs in the women's singles. The explanation is that the player who serves first in a set (if it is not the first set) is usually the weaker player. This is so, because (a) the stronger player is more likely to win the previous set, and (b) the previous set is more likely won by serving the set out than by breaking serve. Therefore, the stronger player typically wins the previous set on service, so that the weaker player serves first in the next set. The weaker player is more likely to lose the current set as well, not because of a service (dis)advantage, but because he or she is the weaker player.

This example shows that we must be careful when we try to draw conclusions based on simple statistics. In this case, the fact that the player who serves first in the second and subsequent sets often loses the set is true, but this concerns weaker players while the hypothesis concerns all players. If we wish to answer the question of whether serving first causes a (dis)advantage, we have to control for quality differences. If we do this correctly, then we find that there is no advantage or disadvantage for the player who serves first in a set; in other words, it does not matter who serves first in the second or subsequent sets. But in the first set it does matter (the book shows why), so it is wise to elect to serve after winning the toss.

HUMAN BEHAVIOR

Studying tennis is not only of interest to those interested in tennis. There is a second (some would say a first) interest, namely the study of human behavior. In professional tennis the players' objectives are clear: they want to win. The incentives to win are strong and the players are highly trained. Tennis data are clean — there are few errors in the data — and each match generates a lot of data: many points, many services, and so on. And a good first impression of the quality of a tennis player is obtained from the world ranking. Such circumstances are rare in psychology, economics, and related disciplines, so that analyzing tennis can help.

One example is the question of whether people become more cautious when pressure mounts. In tennis, some points are more important than others. Do players behave differently in the key points? They do: they play safer at important points. This teaches us something about human behavior, and may have implications outside tennis, for example in economics. If salaries of agents working in the financial sector contain not only a bonus, but also a substantial component, then the consequences of their activities matter in both directions (like winning or losing a tennis match).

FORECASTING

Can we forecast the winner of a tennis match? Let us consider the Australian Open 2012 final between Novak Djokovic and Rafael Nadal. Of course, by now we know the result: Djokovic won by 5-7, 6-4, 6-2, 6-7, 7-5 in the longest grand slam final ever: five hours and fifty-three minutes. The question, however, is what the probability of Djokovic winning before the end was? At the start of the match betting odds revealed a winning probability of 57.4% for Djokovic (and thus 42.6% for Nadal.)

CONCLUSION

The book describes how we update this probability after each point played. The actual calculation is done by our computer program Richard, which is freely available from our websites in a user-friendly format. Richard delivers the updated winning probability within a second and the resulting graph of probabilities provides a quick overview of the match developments so far and a direct forecast of who will win the match.

The figure below shows a graph at 5-5 in the final set, from the point of view of Djokovic. The start of the graph is at 57.4%, so Djokovic was expected to win. At the beginning of the tiebreak in the fourth set, Djokovic had a winning probability of 78%, and at 5-3 in the tiebreak (two points from victory) even 92.2%. But Nadal won the tiebreak 7-5 and the probability dropped sharply to 54.2%. In the final set Nadal broke Djokovic in the sixth game. At that point, 4-2 for Nadal in the final set, the probability had dropped to 16.1%, and at 30-15 for Nadal even to 12.5%. This was the point in the match with the highest probability for Nadal to win: 87.5%. Then, Djokovic broke Nadal's service and so it became 5-5, where the probability was 53.2% and Djokovic was the favorite again. Such swings are not visible in the score, or from summary statistics typically presented on television (percentage of first services in, number of aces, and so on). But the swings are visible in the probability graph. Thus the graph should prove to be a powerful tool for commentators and viewers.

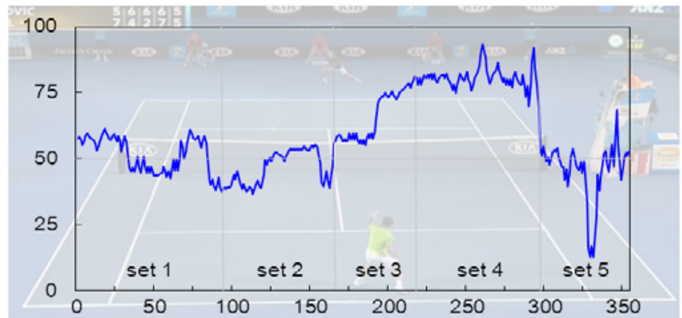

Figure 1. Probability of Djokovic winning the match.

REFERENCES

Klaassen, F. & J.R. Magnus (2014). Analyzing Wimbledon: The Power of Statistics. New York: Oxford University Press.

RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

TennisiCoach

March 3rd 2014 saw 90 nations rally together in celebration of #worldtennisday. Join in the fun and make every day a tennis day.

Celebrate the excitement and fun of playing tennis. It's easy to learn using slower balls on smaller courts.
Have fun with your friends and family and play tennis today.
Tennis... It's easy, fun and healthy!

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Being good mentally: What does it mean?

Merlin Van de Braam (IRL)

ITF Coaching and Sport Science Review 2014; 62 (22): 9 - 11

ABSTRACT

This article gives an overview and explanation of a number of terms related to being a good athlete from a mental perspective; including mental toughness, flow, the ideal performance state and more recent models of psychological resilience. It will then compare and contrast these different models and definitions. The intention of the article is to clarify the literature for readers so that they can gain a clearer understanding of what these multiple, often overlapping constructs mean. Finally, practical advice is offered on ways in which coaches and athletes can work towards being better mentally.

Key words: psychology, mental toughness, ideal performance state, psychological resilience, flow

Article received: 14 September 2013

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Article accepted: 28 November 2013

WHAT MAKES TENNIS A TOUGH SPORT FROM A MENTAL PERSPECTIVE?

Weinberg (2002) outlines several factors that are unique to the game of tennis, and that all present psychological challenges. One of the most recognised challenges is the stop and start nature of tennis which results in a high amount of dead time. In a typical tennis match it is estimated that three quarters of the time is spent not-playing. This "dead time" presents a challenge to the mind as it can wander and be distracted by irrelevant thoughts which can disrupt timing, co-ordination and confidence - especially in the context of a pressurised match environment.

Another unique challenge that tennis players must cope with is that each competitor is required to referee their own game by calling their own lines. Furthermore tennis is an individual sport and therefore performers cannot hide behind team mates' performances, nor are there substitutions which add to the challenge.

Other elements that make tennis challenging from a psychological perspective include that no coaching is allowed in tennis during competition, therefore the formulation of tactics in the context of the match environment rests solely with the competitor- again most sports (especially team sports) do not present such a challenge. Finally, the scoring system in tennis requires performers to always close out a match- in this respect it is unlike sports where a clock is involved and players can simply run down time playing defensively with possession for example- in tennis, it is a requirement to close it out.

PSYCHOLOGICAL TERMS RELATED WITH OPTIMUM SPORTING PERFORMANCE

This section will now discuss the various terms, theories, models and definitions that attempt to explain what is required to perform at the highest level and reach optimal sports performance.

The ideal performance state

Research in this area has tried to address the question- is there an ideal mind/body state related to performing your best in a given sport at a specific time? In its most simple definition, the ideal performance state refers to the presence of the right mental and emotional state when performing. Krane and Williams (2006) elaborate on this by suggesting this ideal mind/body state consists of the following: (a) feelings of high self-confidence and expectations of success, (b) being energized yet relaxed, (c) feeling in control,(d) being totally concentrated, (e) having a keen focus on the present task, (f) having positive attitudes and thoughts about performance, and (g) being determined and committed. Conversely, the mental state typically associated with poorer performances in sport seems to be marked by feelings of self-doubt, lacking concentration, being distracted, being overly focused on the competition outcome or score, and feeling overly or under- aroused. It is generally agreed that this ideal performance state is not a simple, one-dimensional state that is easily obtained, however sports performers can learn how to achieve peak performances more often and with greater consistency (Harmison, 2006).

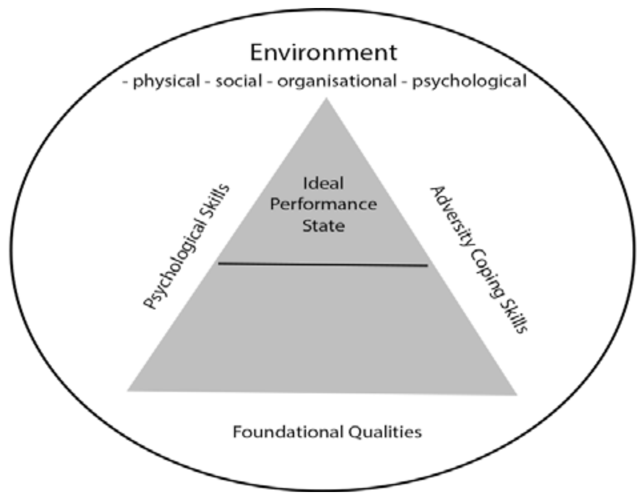

Figure 1. Adapted from Understanding Psychological Preparation for Sport: Theory and Practice of Peak Performance (p. 240), by L. Hardy, G. Jones, and D. Gould.

Flow

When a coach instructs a player not to think about the past or the future in a match, and to stay in the present, they are most likely eluding to 'the flow state'. The construct of 'flow' refers to a yearned for, yet elusive, state of mind that is characterized by complete absorption in the task at hand as well as by enhanced skilled performance (Aherne et al., 2011). Whilst concentration and present moment awareness are the 'lynch pins' of this state of mind, the following aspects are also crucial; a challenge-skill balance, the merging action and awareness, having clear goals, concentration on a task, having a sense of control, a loss of self-consciousness and being unaware of the passing of time (see Jackson, 1995). In a nut-shell, flow requires a present-moment, non-self-conscious concentration on a particular task- applied to tennis, this requires a player to stay focused on one point at a time.

Mental toughness

Definitions and characteristics of mental toughness have been proposed by many authors, leading to a diverse range of positive psychological characteristics being associated with mental toughness. Unfortunately, a majority of the explanations have come from anecdotal evidence and personal accounts which puts in question the validity of these findings (Jones et al., 2007). However in a study of Olympic champions, coaches and sport psychologists, mental toughness has been defined as "having the natural or developed psychological edge that enables you to, generally, cope better than your opponents with the many demands (competition, training, lifestyle) that sport places on a performer and, specifically, be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure" (Jones et a., 2002, p248). The results from the study also indicated that mental toughness was developed throughout their careers and was also capable of fluctuating from high to low.

So what makes this edge? A set of 12 factors were outlined by Jones et al. (2007) in their mental toughness framework. These factors are related to attitude, training, competition and post competition and include among others (a) belief: having an unshakable self-belief and inner arrogance that makes an athlete believe that they can achieve anything they set their mind to, (b) focus: ensuring sport is the number one priority but also recognising the importance of being able to switch off, (c) using long-term goals to stay motivated and pushing yourself to the limit during training, (d) handing pressure through loving the pressure of competition and not being phased by mistakes and, (e) recognising and rationalising failure whilst also being able to manage success when it comes. See figure 1.

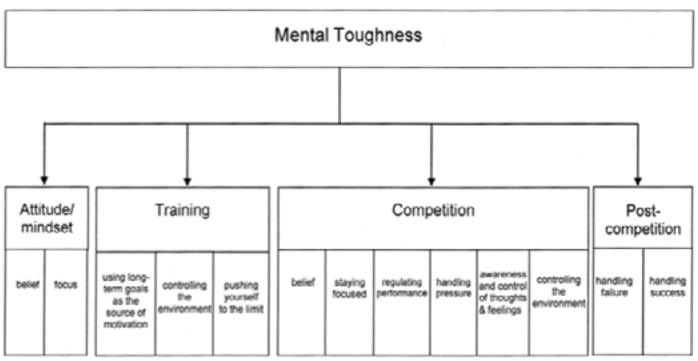

Figure 2. Mental toughness framework from Jones et al. (2007).

PSYCHOLOGICAL RESILIENCE

Psychological resilience is another theory that attempts to explain the reasons behind why athletes appear to be able to reach optimum sporting performances in their career. The grounded theory presented by Fletcher & Sarkar (2012) investigated 12 Olympic medalists. Results from this ultra-elite sample offers a more holistic and overarching concept for understanding optimal sports performance than the aforementioned constructs of mental toughness, flow or the ideal performance state. Simply put, psychological resilience attempts to explain optimal performance through dealing with stressors in an adaptive manner over an athletic career. "Numerous psychological factors (relating to a positive personality, motivation, confidence, focus, and perceived social support) protect the world's best athletes from the potential negative effect of stressors by influencing their challenge appraisal and meta-cognitions (Fletcher & Sarkar, 2012, p 673). It is suggested that these processes promote facilitative responses that precede optimal sport performance.

Challenge appraisal is where an athlete has the tendency to perceive stressors as opportunities for growth, whereas meta-cognitions, in a simplified sense refers to reflective internal thinking.

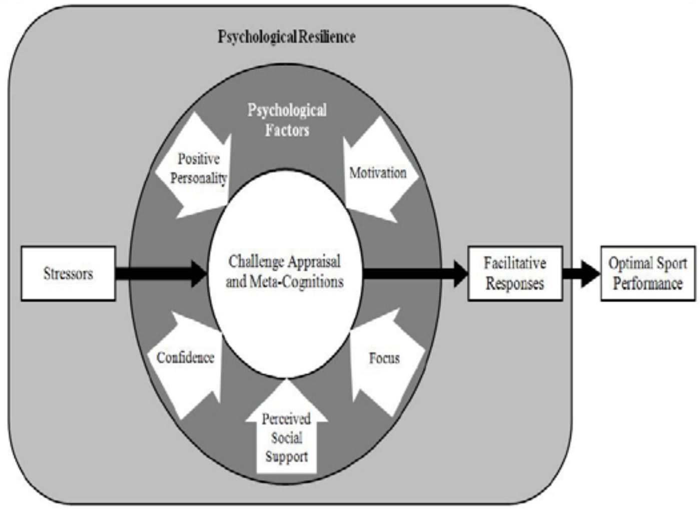

Figure 3. Fletcher & Sarkar's (2012) grounded theory of psychological resilience and optimal sports performance.

This appraisal and evaluation is key to psychological resilience and as stated, will be improved by the athlete's own psychological factors. In explanation; the more positive, the more confident, the more motivated, the more focused and the more perceived social support an athlete has, the more likely they are to positively react to the inherent competitive, personal and organizational stressors within their environment (see Fletcher & Sarkar, 2012). The model depicts these concepts and the inter-relationships of this grounded theory.

THEORY/MODEL	IS THE INDIVIDUAL OR THE ENVIRONMENT THE MAIN FOCUS?	IS IT STABLE OR CAN IT FLUCTUATE OR DISAPPEAR OVER TIME?	TRAINABLE - CAN IT BE IMPROVED?
IDEAL PERFORMANCE STATE	*Internal mental and emotional state is the focus*	*A temporary state or experience*	*Yes*
FLOW	*Internal state of mind is the focus*	*A temporary state or experience*	*Yes*
MENTAL TOUGHNESS	*Individual as well as competition, training and lifestyle factors are a focus*	*More prolonged characteristic*	*Yes*
PSYCHOLOGICAL RESILIENCE	*Individual, competition, personal and organisational environment are important*	*More long-lasting process over athletic career*	*Yes*

Table 1. A cross-comparison of psychological models.

DISCUSSION

The table above illustrates clearly that regardless of the multitude of definitions, their focus, or the stability of the construct - athletes can work on and improve on certain aspects that relate to any of these constructs. This offers encouragement to both athlete and coach who should look to improve one or all the subcomponents of any of the above models. For example - concentration and focus is a common element in all of the aforementioned definitions and therefore is just one example of an ability that should be worked on by the athlete and coach.

For athletes and coaches looking to optimise their psychological resilience, Sarkar & Fletcher (2012) provide helpful guidelines based on their research on Olympic champions;

1) Develop a positive personality - view setbacks or adversity as opportunities for growth

2) Optimise motivation - be aware that motivation can come from multiple sources e.g. internal self- achievement can come hand in hand with proving one's worth to others (external motivation)

3) Strengthen confidence - understand that confidence can be built up through preparation, experience, visualisation, team-mates and coaches as well as achieving goals

4) Focus on what you can control, on processes, the present moment, positives and staying composed

5) Recognise the availability and importance of social support- as an athlete one should seek support through mentors, building cohesive teams and hiring support staff that can be believed in.

REFERENCES

Aherne C, Moran AP, & Lonsdale C. (2011). Mindfulness and flow in sport: An initial investigation. The Sport Psychologist, 25, 177-189.

Harmison, R.J. (2006). Peak performance in sport: Identifying ideal performance states and developing athlete's psychological skills. Professional psychology: Research and Practice, 37, 233-243.

Fletcher, D., & Hanton, S. (2003). Sources of organizational stress in elite sport performers. The Sport Psychologist, 17, 175-195.

Flethcer, D., & Sarkar, M. (2012). A grounded theory of psychological resilience in Olympic Champions. Psychology of Sport and Exercise, 13, 669-678.

Jackson, S.A. (1995). Factors influencing the occurrence of flow state in elite athletes. Journal of Applied Sport Psychology, 7, 138–166.

Jones, G., Hanton, S., & Connaughton, D. (2007). A framework of mental toughness in the world's best performers. The Sport Psychologist, 21, 2443-264.

Jones, G., Hanton, S., & Connaughton, D. (2002). What is this thing called mental tough- ness? An investigation of elite sport performers. Journal of Applied Sport Psychology, 14, 205-218.

Krane, V., & Williams, J. M. (2006). Psychological characteristics of peak performance. In J. M. Williams (Ed.), Applied sport psychology: Personal growth to peak performance (pp. 207–227). New York: McGraw-Hill.

Sarkar M., & Fletcher, D. (2012). Developing resilience-lessons learned from olympic champions. The Wave, Lane 4, 2, 36-38. Retrieved June 15th 2013 at http://issuu.com/lane4/docs/thewave_october_2012a/41?e=0

Weinberg, B. (2002). Tennis: winning the mental game. Champaign, IL: Human Kinetics.

RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

TennisiCoach

Multi and interdisciplinary intervention in tennis

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ABSTRACT

When undertaking a project focused on high-performance, it is necessary to establish clear and constant communication among the entire multidisciplinary team, who in today's scene need to go through a process of decentralization, consisting of sharing tasks and knowledge among the professionals from the different areas of work that make up the interdisciplinary team.

Key words: high-performance, interdisciplinary intervention, plan

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INTRODUCTION

When undertaking a project focused on high-performance and professionalism, a plan must be devised as a team with all the areas of work inherent in training sports (coach, physical trainer, physiotherapist, nutritionist, psychologist, doctor, etc.). This plan has the objective to maximize the probability of developing more tennis players with the tools to achieve excellence in the sport.

MULTIDISCIPLINARY INTERVENTION

Nowadays, it is common to come across statements such as "it's really tough to play tennis". However, in actual fact, this sport isn't hard to learn or practice, especially with the methodological advances made over the years such as the creation of "Play and Stay" and "Le Petit Tennis". Tennis is—yes—a complex sport, which in order to succeed in and perform at the highest level requires significant development in the four main areas inherent to it: technical, tactical, physical and psychological (Kovacs, 2007). In this sense, the formation of a high-performance athlete entails a qualitative and cautious job that results in such development in these areas. It is from this concept that the role of the multidisciplinary team stands out.

Due to its complex nature, to which various areas of human knowledge apply, tennis presents the need for the multidisciplinary team to be composed of specialized professionals capable of understanding and hence working on the development of each of these areas. For example, the court coach, who is responsible for the development of the technical and tactical areas, needs to be well informed in biomechanics and pedagogy in order to have the proper conditions to correct the mechanics of all strokes and to create exercises that simulate the player solving problems during a match (tactical development). The physical area, on the other hand, is the responsibility of the physical trainer, physiotherapist, nutritionist and doctor, who should together guarantee the athlete the proper health and physical conditioning needed to perform in the best way possible. The psychological area is handled chiefly by the sport's psychologist, who should be able to understand the emotional and mental factors that interfere in the tennis player's performance with the purpose of helping the player to improve behaviourally in tournaments and training.

In the meantime, it must be clearly noted that a junior tennis player can supress the need for improvement in one of these areas with advanced development in another. For example, a player who is not well prepared physically may still find a way to keep winning through technique, tactics and psychological strength. However, when thinking about high-performance and professionalism, excellence must always be sought—simply stated: high-level performance in all areas.

INTERDISCIPLINARY INTERVENTION

The evolution of the game of tennis during the past 20 years has resulted in the augmentation of the number of scientific researches and groups of studies/projects focused on understanding the demands of this sport from an interdisciplinary point of view (Fernandez-Fernandez, 2013).

Corroborating, this interdisciplinary view proposes that the tasks spread among the different areas of the sport should be executed in a joint manner, without losing the specificity of each one, making the acquisition of more ample and deepened knowledge possible for athletes (Barbieri et al., 2008).

With this characterization, it is possible to conclude that, in order to induce maximum development in high-performance athletes, a joint job with all areas involved is necessary, allowing the maximization of the probability of developing more tennis players with means to achieve excellence in the sport.

Building on this conclusion, the majority of clubs and high-performance centres today possess a wide range of professionals such as psychologist, nutritionist, court coach, physical trainer and physiotherapist in their staff, forming a multidisciplinary team. Nonetheless, what is the communication among these professionals like? In other words, does the interdisciplinary work among these professionals actually exist?

When talking about high-performance, a plan is required. However, this plan must be devised as a whole with all the areas in a manner that permits the development of one area to positively influence the development of another and not vice-versa. Having said that, it is common to find in a day or training session the diverse areas working together on the player, in which the technical-tactical work, for example, may suffer interference from the physical conditioning area as well as from that of nutrition and so forth.

To illustrate the need for the interdisciplinary approach, consider a physical trainer who conducted an intense agility training session in the morning composed of sprints and changes of direction. Upon completing this session, the athlete heads off to the court, where his court coach has prepared an intense couple of hours of training comprised of lengthy ball exchanges and lots of movement. Unhappy with the session and assuming the athlete is not putting in maximum effort, the court coach decides to augment the intensity of the training even more, demanding more and more from the athlete. The next day, the athlete will rarely be able to move around the court efficiently due to physical exhaustion accompanied with muscular pains, which in turn could progressively lead to injury as a result of ill-planned loads of training.

In this form, the problem occurred due to inefficient—or perhaps even lack of—communication between the court coach and the physical trainer and, on top of that, lack of an interdisciplinary plan.

Adding to that train of thought, Davids et al., (2008) state that significant variations in work philosophy within a team will be noted and recognized, however the support to an integral approach is fundamental. Having said that, it is worth noting that it is common to come across situations that limit interdisciplinary development in tennis centres, such as:

- All work executed is centralized in only one professional of the team usually known as "Head Coach"
- Professional insecurity when it comes to sharing specific knowledge of an area or delegating a certain activity to another member of the interdisciplinary team
- Vanity, ego.

This being so, figure 1 aims to illustrate the interdisciplinary intervention within the scope of tennis.

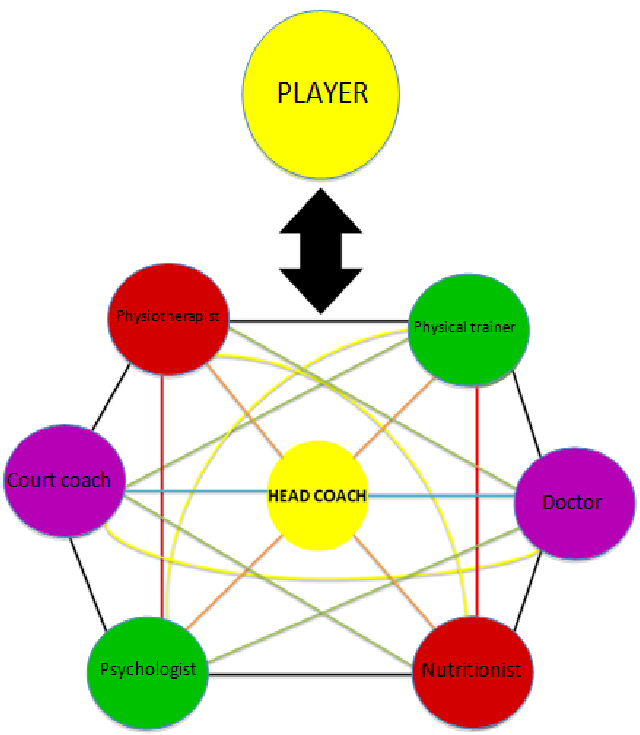

Figure 1. Interdisciplinary intervention in tennis.

CONCLUSION

Tennis is a complex sport that in order to succeed in and perform at the highest level demands maximum development in all aspects inherent to it. Technical, tactical, physical and psychological areas all require clear and constant communication throughout the entire multidisciplinary team, who in today's scene needs to go through a process of decentralization, consisting in sharing tasks and knowledge among the professionals from the different areas of work that make up the interdisciplinary team.

REFERENCES

Barbieri, A., Reimberg, A.E.C., Dipicoli, M.A., Caron, R.S., Prodócimo, E. (2008). Interdisciplinarity, social inclusion and evaluation in physical education: contributions of the theory of multiple intelligences. Rev. Mackenzie de Educação Física e Esporte, 7(2), 119-127.

Davids, K., Handford, C., Williams, M. (2008) The natural physical alternative to cognitive theories of motor behaviour: An invitation for interdisciplinary research in sports science? Journal of Sports Science, 12(6), 495-528.

Fernandez-Fernandez, J. (2013). Special issue on tennis. Journal of Sports Science and Medicine, 12.

Kovacs, M.S. (2007). Tennis Physiology: Training the Competitive Athlete. Sports Medicine, 37(3), 189-198.

RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

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A novel analysis of grip variations on the two-handed backhand

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ABSTRACT

This article discusses the variations of grips used on the two-handed backhand. Subjects were the top 100 WTA and ATP touring pros and a qualitative, longitudinal analysis is presented. The concept of hand spacing gaps, precision and power grips were introduced in conjunction with more traditional description of grips. In addition, gender and individual differences are discussed.

Key words: two handed backhand, power grip, precision grip

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INTRODUCTION

Due to the several possible placements of the hands, the two-handed backhand has many variations. Often students are taught to place the dominant hand at the bottom in either an eastern backhand or continental grip. The other hand is placed higher on the grip usually in the eastern forehand grip but there are variations using continental or western grips. Less attention is given to the top or non-dominant hand except the suggestion that the top hand dominates in 90% of cases and hence the eastern forehand grip should be used (Schönborn, 1999). Crespo and Miley (1998) discuss other grip variations and greater flexibility in hand dominance. McCullough (1984) discussed grip variations and consequences of grip on technical styles and topspin production. This article focuses on some of the subtle differences in grips that traditionally go unnoticed but may have significant effects.

RESEARCH METHOD

In this study, we examined the top 100 WTA and ATP players as of March 4, 2013 rankings. Among these players 96 WTA and 78 ATP players used two-handed backhands. Close-up high quality photographs of 5-8 strokes of each player were examined to verify consistency. Some players were found to vary grips depending on contact point, body position, and court position. In those cases, up to 8 photos were studied and the most frequently observed grips were considered normal for the player. Both authors independently verified the grips of all players to insure inter-rater reliability.

PRECISION AND POWER GRIPS

In examining the grips, it was found that there were 2 variations of the dominant or bottom hand. These grips were continental and eastern backhand grips. In addition, the fingers were spread out in 2 variations. We define strong precision and regular precision grips in reference to how the hand and fingers are placed. If the index finger is well extended and there are visible gaps between at least two fingers, the grip was classified as strong precision. In a regular precision grip, fingers are closely placed without gaps, almost perpendicular to the length of the racquet, and with only a slight extension of the index finger.

The top hand or non-dominant hand had several variations that are classified in Figure 1. The two main variations are precision and power grips as originally define by Napier (1956). Precision grips have the thumb between the first two fingers where the thumb and first two fingers are almost pinching. Power grips place the thumb in the plane of the palm above the fingers, applying pressure opposite the fingers. Landsmeer (1962) discussed the grasping of a cylindrical object which is similar in shape to a tennis racquet grip. Figure 2 shows examples of both hands using a precision and power grip with the non-dominant hand. Finger pressure is applied differently with these grips.

Figure 1. Top hand grips. From left to right: precision eastern grip, thumb on fingers eastern grip, two power grip variations with fingers above top of grip.

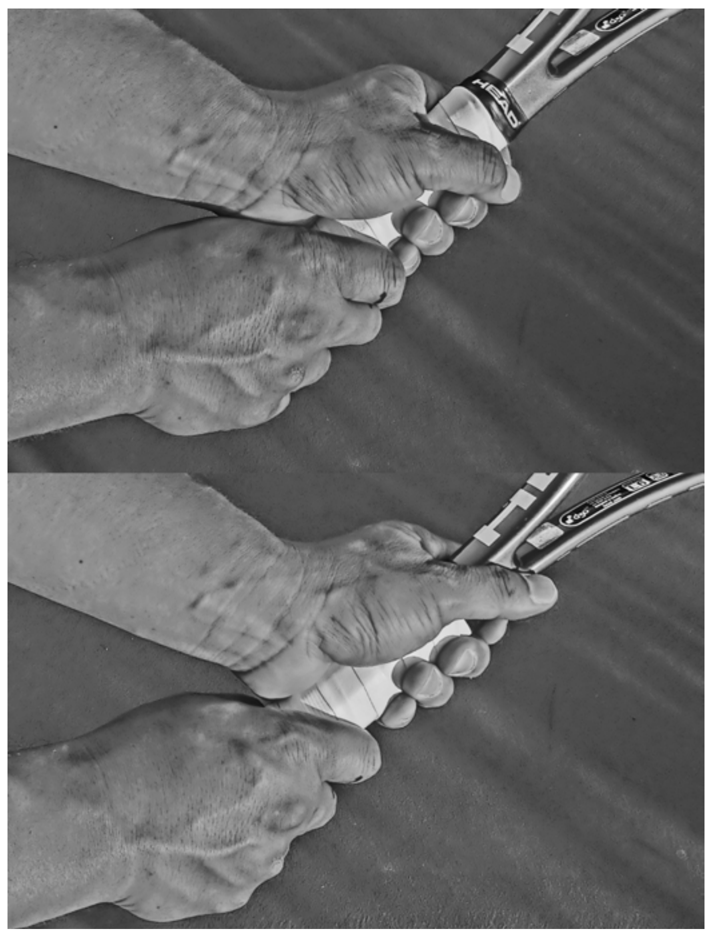

Figure 2. Two handed grip variations. Top: bottom hand using continental grip with top hand using precision eastern, Bottom photo: bottom hand using continental grip with top hand using eastern forehand power grip.

TWO-HANDED GRIPS			
	ATP	WTA	TOTAL
BOTTOM HAND			
Continental Strong Precision	*13*	*15*	*28*
Continental Regular Precision	*58*	*63*	*121*
Eastern Backhand	*7*	*18*	*25*
TOP HAND			
Continental Precision	*4*	*14*	*18*
Eastern Precision, thumb on grip	*19*	*45*	*64*
Eastern Precision, thumb on fingers	*25*	*19*	*44*
Eastern Power	*22*	*8*	*30*
Semi-Western	*5*	*8*	*13*
Continental Power	*3*	*0*	*3*
Number of Players in Top 100	*78*	*96*	

Table 1. Grip variations of the top 100 WTA and ATP players.

Table 1 summarizes the grip variations of the top 100 WTA and ATP players. The bottom hands were more similar than different. Women were more likely to use an eastern backhand with the bottom or dominant hand. Regardless, both ATP and WTA players most frequently used regular precision continental grips.

With the top hand, ATP pros don't seem to have a one predominant style. Although the eastern grip was used by 66 of the men, it was almost equally split between eastern precision with the thumb on the grip (see Figure 1), eastern precision with the thumb on the fingers, and the eastern forehand power grip. WTA players tend to use the eastern precision with the thumb on the grip itself. Having all fingers placed on the racquet is more common with the WTA pros than ATP pros. In Table 1, in green are precision grips which 78 (81%) of WTA players use but only 48 (62%) of ATP players use. In blue, are power grips which 30 (38%) of ATP players use but only 16 (17%) of WTA players use. Hence, men used power grips more frequently than women. It is important to note that despite trends among genders, players have some individuality.

Of interest is studying the gender difference in the usage of power and precision grips. Coaches are more familiar with gender differences regarding tactics and some strokes such as serves and one-handed backhands. It is possible that grip differences may affect technique and even tactics.

HAND SIZE AND GRIPS

Table 2 shows some measurements of placement of the hands. One measurement was the spacing or gap between hands. Some 49% of ATP and 53% of WTA lacked a gap. The placement of the top hand near the tape of the grip (or overgrip) was also measured. The majority of WTA players (68 or 71%) were below the tape but only 22 (or 28%) of ATP players had the hand below the tape.

HAND PLACEMENT			
	ATP	WTA	TOTAL
GAP BETWEEN HANDS			
No Gap	*38*	*51*	*89*
Gap 0-1 inch	*39*	*36*	*75*
Gap 1-1.5 inch	*0*	*3*	*3*
Gap more than 1.5 inches	*2*	*6*	*8*
TOP HAND PLACEMENT			
Below top tape	*22*	*68*	*90*
On top tape	*34*	*15*	*49*
Above top tape	*23*	*13*	*36*
Number of Players in Top 100	*78*	*96*	*174*

Table 2. Measurements of placement of the hands.

Essentially, men generally lack a gap between the hands and the top hand was placed on the tape. Simply put, the length of the grip may be too short for many men. Women, with smaller hands, were able to place both hands on the racquet below the tape. They didn't run out of space on the grip.

The fact that WTA players still had space on their grips, may have contributed to their greater tendency to use precision grips compared to ATP players. Some 45 of the women were able to use the eastern precision grip with the thumb on the racquet (see Figure 1a, second photo from the left). ATP players ran out of space on the grip so the top hand often went on or above the tape. In addition, the thumb was often placed on the fingers or above as in the power grip. Lack of grip space may result in many ATP pros grasping the racquet with fingers closer together. The closer fingers tend to promote power grips. On the other hand, WTA players were able to spread their fingers more comfortably and use precision grips allowing the fingers to spread.

TECHNICAL CONSEQUENCE

Because men use power grips more than women, they may be more left-hand dominant. However, another factor is the grip of the bottom hand so the left hand grip may not exclusively determine dominance. The power grips allow ATP players to apply different and more pressure with the left hand, increasing tension and rigidness of the arm. Hence, less bending of the wrist and elbows may occur with ATP players during the swing. This grip style might help contact on high balls and apply greater spin.

One of the differences seen in Table 1 was the use of the continental precision grip with the top hand. Only 4 men used this grip compared to 14 women. The continental precision grips among women may make it more difficult to hit heavy topspin. The continental grip places hands, elbows and arms closer together. That effect may reduce left-hand dominance but promote synchronous use of both arms. It has been noted that wrist injuries are more frequent among female tennis players with the suggestion that females rely on the left hand more (International Tennis Performance Association, 2012).

The rare continental power grip was used by only ATP players, namely three of the tallest players (Del Potro, Isner, and Raonic). Although it can be viewed as similar to the continental precision grip, it has key differences. First, the tall players naturally have contact points lower than for the average-sized player. Second, the power grip tends to make the arms more rigid and straight. As a result, Isner can naturally play a relatively low ball with straight arms.

The ATP power grips make the non-dominant hand more rigid. That may allow the top hand to overtake the bottom hand in a push-pull stroke. In essence, that means, the top hand pushes forward with much greater forward velocity than the bottom hand which may even decelerate. That could be helpful on wide balls and high balls. The top hand could also push more easily upwards to increase spin.

Having a gap between the hands may increase stability on some shots and increase maneuverability on other shots. However, particularly with larger gaps, leverage with the left arm is sacrificed in exchange for more control. There appears to be no meaningful difference between genders in gaps.

CONCLUSIONS

There are subtle differences with the grips on the two-handed backhand that are traditionally ignored. It is important to note that differences are both individual and gender-based.

It is likely that racquet manufacturers make the grip too short for the modern ATP player. A manufacturing change in grip length might affect the top hand grip and gap between hands. Forty years ago, the two-handed backhand was less common and athletes were generally smaller. Today's ATP players are often 6'1-6'5" and two-handed backhands are the norm. The use of both hands and larger hands on smaller grips have changed the grips favored by both genders, especially the men. In turn, the grips have influenced technical changes. Coaches should also recognize precision and power grips which may be taught as variations or in conjunction with traditional continental, eastern and western grips. Coaches should allow players to experiment with different grip combinations while recognizing technical advantages and disadvantages.

REFERENCES

Crespo, M. and Miley, D. (1998). International Tennis Federation Advanced Coaches Manual. London, UK: International Tennis Federation. pp 72-73.

International Tennis Performance Association (2012). CPTS Workbook and Study Guide, p 16.3.

Landsmeer, J.M.F. (1962). Power Grip and Precision Handling. Annals of the Rheumatic Diseases, 21(2), 164–170.

McCullough, J.E. (1984). Two-Handed Tennis. New York, NY: M. Evans and Co. Ch 5 pp 58-69.

Napier, J.R. (1956). The Prehensile Movements of the Human Hand. Journal of Bone and Joint Surgery 38-B(4), 902-13.

Schönborn, R. (1999). Advanced Techniques for Competitive Tennis. Vienna, Austra: Meyer and Meyer Verlag. pp 64-65.

The use of technology for a technical analysis in tennis - A tribute to Gilles de Kermadec

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ABSTRACT

The storage capacity of a growing number of data and images, the ability to capture 1000 frames per second and the improved speed of editing mark a new stage in the technical analysis of sporting actions. Today, just type the word “tennis” in any search engine and browse the Internet to see the many results. Due to this, it seemed useful to us to have three tennis experts; a historian, a researcher in biomechanics and a National Technical Director, to reflect on the impact of technology in the development of technical analysis and teaching.

Key words: technique, technology, anthropology, biomechanics, education

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A CENTURY OF TECHNOLOGICAL INNOVATIONS

In the origins of the modern game, late nineteenth century, tennis champions could have easily avoided coaches and "coaches" were often considered as self-taught. At the beginning of the twentieth century, the invention of photography and Chronography transformed the way the act of playing tennis was represented. One early was of presenting the movements, experimented by Marey and Muybridge Demeny in 1882 and in 1887, was decomposing multiple sequences that could overlap and join each other. This allows using wide shots or angles of differing viewpoints, to isolate the details in order to better understand the effective movement of the top players (Beldam & Vaile 1905 Vaile, 1906; Paret, 1926, Lacoste, 1928).

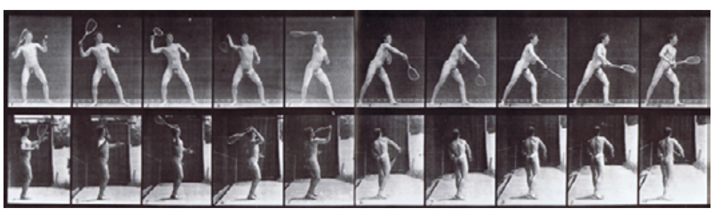

Figure 1. Plaque 294, electrophotographic phases in Animal Locomotion, Muybridge, 1887.

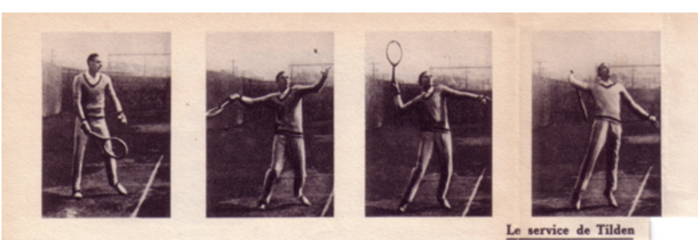

Figure 2. Kinograma from Tilden, Tennis, René Lacoste, 1928.

This is the same path that Gilles de Kermadec undertook from 1953 to 1998 as his “technical studies" appeared in ´Tennis de France´. This allows one to initially decompose the mechanical development of action image to image. Then gradually with these increasingly accurate cinematic procedures, it is possible to modify their technical analysis.

Thus, in 1956, with the service of Lewis Hoad, Gilles de Kermadec classically decomposed the act into six phases: Start, preparation, loop rotation, pause, impact, and arrows to analyze the path made by the racket. In the 60s, with the use of more sophisticated cameras, 25 fps, a better definition of the images was achieved and allowed the use of "zoom" to one or another area of the body in the service, which facilitates the decomposition of the forces involved in the "perfection of the act" (Kermadec, 1965).

In 1973, the first investigations of electronic image analysis with the invention of the VCR appeared but as Gilles de Kermadec stated, "It will take several years yet before it can be affordable to all and to all the clubs.” One would have to wait for the beginning of 80s to have the first images of biomechanic modeling studies obtained by computer calculations (Durey & Kermadec, 1984). "This is a long term project in which the computer participates ... the project will observe a single shot not only from front and side but also from above ... Meanwhile we will only have subjective approaches of the image that each player is performing ..."(Kermadec, 1986). From the 90s, the service action was analysed more commonly as a result of a cinematic chain with the summation of the different muscle groups starting from the feet to the final impact with forearm supination.

At the beginning of the third millennium we have definitely moved from a purely mechanical conception of the stroke to a biomechanical analysis (Solves, 2006; Elliot Reid & Crespo, 2006). In short, parallel to technological innovations in image processing, we observed a change in the perspective in the technical design of the movement.

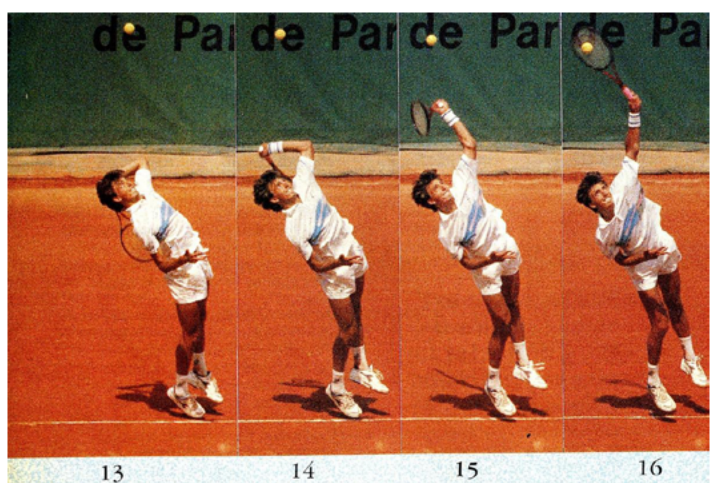

Figure 3. Extract from Technicorama of Goran Ivasenevic by Gilles de Kermadec, ´Tennis de France´ 460-92, 1991.

CURRENT RESEARCH IN BIOMECHANICAL INVESTIGATION

Today optoelectronic systems are used, consisting of infrared cameras to capture a very high frequency (300 frames/s) and three-dimensional movements of the service of the players. The motion capture laboratory enables a biomechanical analysis by calculating the kinematic and dynamic variables relating to performance optimization and the understanding of the mechanisms in joint injuries. Along with measuring devices and analysis of muscle activity by EMG, combining these techniques allow observation and measurement from images to obtain additional data on muscle activity. They have the advantage of being able to eventually access efforts and "internal" system limitations and, therefore, investigate the parallel performance factors and also what is new and interesting in reference to the potential risk in injury. The timing of the rotation is best observed during the action of the serve, increasing the speed of the ball increases, and limitation of joint constraints experienced by the upper member (Martin, 2013). The investigations go even further to analyze the biomechanics of the serve from motion capture without placing body markers on the player (Sheets et al., 2011).

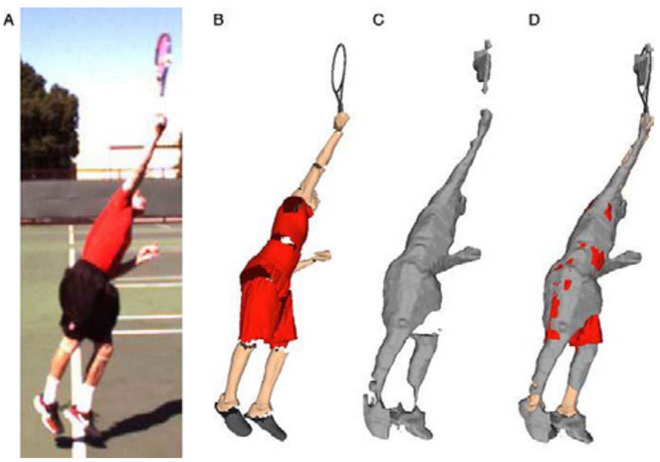

Figure 4. The markerless motion capture: Images of a player performing a serve. A) Video image. B) Reproduced model. C) Partial rendering 3D Player. D) Final 3D image taken from Abrams et al. (2012).

IMPLICATIONS FOR EDUCATION AND TRAINING

Today the problem is to provide for the coaches who favour scientific information dissemination. On the other hand, the educational philosophy developed by Gilles de Kermadec is more important than ever before, "look at the champions play, and try to identify common ground to establish the foundations of teaching tennis." The still photos and text captions are obvious to all and you do not need to be a ballistics expert to realize that the Nadal racket is facing the back fence of the court at the end of the preparation on his forehand.

One option to encourage knowledge sharing is to emphasize the relationship between laboratories engaged in sports science and the training services of the Federations. In France, there are currently research agreements with Nicolas Benguigui in Orsay, Caroline Martin in the ENS Cachan-Bretagne, with sports science laboratories of Caen, Poitiers & Lyon that led to publications in the Journal for coaches (Martin, 2012).

A second alternative is to mutualise data and encourage exchanges of information, not only with investigations but also to be interactive - critically - through various forms of remote experimentation. Indeed, ease of access to transmission of data over the Internet allows for discussion between the different stakeholders, track the performance of technical evolution thanks to the possibility of putting the videos online. Evolving, these collaborative platforms are undoubtedly a tool with a promising future and a valuable tool for the planification of coaches (Tennis Info, 2013).

CONCLUSION

Finally, the history of technology teaches us the importance of not only preparing future coaches to use these devices, but to learn how to be able to question their knowledge as new research (Pestre, 2009). The concept that we have of the training or education can be excellent in a given era but become obsolete some decades later. Facilitating the exchange between theoretical knowledge and practical experience will be a necessary competence for future coaches.

Ultimately, the history of technology in the analysis of sports movement reveals not only the inventory of actions considered for effective performance at a particular time, but motivates us to be attentive to technology from an epistemological perspective and critique. What really matters is not the information obtained by research laboratories, but the interpretation of the truly useful and relevant information that can be applied to training and competition. This article is dedicated to the memory of Gilles de Kermadec who has managed to pass on to many generations of players and coaches the importance of image for understanding the technique of the tennis player.

REFERENCES

Beldam, Georges & Vaile, P.A. (1905). Great lawn tennis players. Their methods illustrated. Illustrated by 229 action-photographs. Londres : Mac Millan & Co.

Durey Alain, De Kermadec Gilles (1984). Tous les coups du tennis et leurs effets, Science et Vie, n°147, juin 1984.

Elliot Bruce, Reid Machar, Crespo Miguel (2006). Biomécanique du tennis, London, International Tennis Federation.

Lacoste René. (1928). Tennis. Paris, Grasset.

Martin, Caroline. (2012). « Lien entre les rotations des segments du corps vers l'avant et la vitesse de balle au service chez les joueurs de haut niveau », in Le magazine du Club Fédéral des enseignants professionnels, n°77, p.6-9.

Martin, Caroline. (2013). "Analyse des déterminants biomécaniques du service au tennis: amélioration de la vitesse de balle et identification des risques de blessures", thèse en cours à l'Université de Rennes/ENS Cachan, S2P Ker-Lann.

Paret, J.P. (1926). Mechanics of the game of lawn tennis, New York, American Lawn Tennis, Inc.

Pestre B. (2009). La politique de la FFT en matière de formation des jeunes. In Le Tennis dans la société de demain, sous la dir. L.Crognier & E.Bayle, Montpellier, éd.AFRAPS, p.187-190.

Peter J-M & Fouquet G., (2010). Le corps en mouvement et la production d'images : du chronophotographe de Marey au numérique, in The International Journal of Sport Science and Physical Education, STAPS, 89, 91-99.

Sheets AL, Abrams GD, Corazza S, Safran MR, Andriacchi TP. (2011) Kinematics differences between the flat, kick, and slice serves measured using a markerless motion capture method. Annals of Biomedical Engineering, 39(12):3011-3020.

Solves, Alain. (2006).Les étapes de l'enseignement du service, les forces agissantes, in Lettre de l'Entraîneur n°43, édition FFT, 15 novembre 2006, page 1.

Tennis info. (2013). FFT 2016, Plateforme suivi des joueurs à la loupe, n°450, édition FFT, p.30-31.

Vaile, P.A. (1906). The Strokes and Science of lawn tennis, New York, American Sports publishing Company.

RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

Developing stroke flexibility

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ABSTRACT

Variability is the key to greatness in cooking, tennis and probably anything in life. True mastery can only be achieved through maturity, and maturity is nothing more than an accumulation of a great variety of experiences. Therefore, to develop more effective shots, the traditional way of training needs to be adjusted to allow players to practice with a much greater degree of variability, forcing the players to constantly adapt and thus develop the desired stroke flexibility.

Key words: variability, strokes, development, drills

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INTRODUCTION

Even at a beginner´s level, the concept of variability should be an integral part of the learning process. Ideally, the coach should teach beginners to rally with each other as soon as possible, avoiding the use of the basket as the main teaching tool. When players learn mostly by hitting balls fed from a basket, they face a huge shock the first time they try to play with someone other than the coach. They realise that it is a lot harder to play tennis when the ball is not fed at an ideal height and speed or that it is very difficult to keep a rally going when your shots go all over the court.

A much better alternative is to learn to play tennis by modifying the length of the court and the type of balls used beginners experience the game from the first lesson.

Players will enjoy the game much faster if they are taught a form of real tennis from the first lesson. Real tennis involves great variability and a large degree of control: two players hitting with each other, not one feeding a ball from a basket and the other one hitting it over the net. By starting the players close to the net and using slower balls (foam or slower balls are readily available), a coach can allow players to experience the feel of the game form the first lesson. As the players improve their ability to rally with slower balls from a shorter distance to the net, the coach can proceed to lengthen the distance between the players and use other types of balls until the players can comfortably rally from the baseline with regular balls. (In fact, in this respect the teaching industry is slowly changing, and introducing tennis to children and beginners by modifying equipment and courts is much more common.)

Once players can rally comfortably form the baseline, the coach should force the players to constantly adjust, by offering lessons with a high degree of variability. Players should experience hitting the ball at different heights, speeds, spins, and direction every time they are on the court. Here are a few drills to help beginners and low intermediate players experience ball control in a whole new light.

Different heights

Players have to hit the ball at three different levels: low, up to four feet over the net; medium, between five and eleven feet over the net; and high, over 12 feet. At first, the players should focus on constantly keeping the ball at a certain height. After they are comfortable doing this, then they should vary their height in the same rally.

Different lengths

Players should experiment with three lengths: short, inside service box, medium, just past the service line; and long, close to the baseline. One good progression is to start by trying to keep the ball inside the service box, then move back and try to hit the ball as close to the baseline as possible. After a while, players should work on rallying while letting the ball bounce twice to force them to hit the ball short.

Both bounces should land inside the baseline. Finally, players should try to rally hitting very short shots that will bounce three times inside the baseline every time.

Different speeds

Player should experiment with three different speeds: slow, medium and fast. The ideal speed will be different for each player, but the idea is to stay under control, even with the fast hits. If players are missing too much, they should adjust their swing speed accordingly.

These are just a few drills to help you understand the concept. Devise your own drills, mixing up all the variables according to your players´ability.

Once the players acquire a certain degree of control the coach should introduce the most important element involved in developing flexibility: spin.

THE MAGIC OF SPIN

Understanding the magic of spin is the first large obstacle for beginning and intermediate players, and one most players fail to overcome. Being able to hit with different spins is the main advantage advanced players have over everyone else. Spin opens the door to a whole new world of possibilities, allowing the players to control the ball much better at higher speeds.

There are three types of spin that any aspiring player should master: flat drive, topsin and slice. Every shot in tennis has one of these types of spin to different degrees, and the ability to hit the ball with different types and degrees of spin will provide the groundwork to achive the necessary ball control to develop as a player.

The following exercise will help the players understand and feel comfortable with the concept of spin.

SPIN DRILLS

Introduction to spin

There are several ways to introduce spin to your players. Here are a few ideas that have worked for me.

Use a large light ball

Using a large ball will allow very young players to safely experiment with spin. By brushing up along the side of the ball or down under it while the coach holds it with his index fingers letting it spin, the players will be able to experience firsthand what it means to spin an object. The size of the ball and its slow movement provide excellent feedback to the players.

Use the palm of the hand

Using the palm of the hand of your non-hitting hand to press the ball against the strings provides a great platform for novice players to understand spin. From this position the player can move the racquet up or down, keeping the hand still, and observe the balls rotation.

Bounce and spin

A good way to introduce the slice is by having players toss the ball up, let it bounce and then try to make the ball spin by using a chopping motion with their racquet across the bottom of the ball. Once the players are able to make it rotate, they can try to keep the ball in the air without letting it bounce by constantly chopping under the ball with spin.

Use the net tape

By pressing the ball against the net tape with the racquet and then brushing up to drop it to the other side of the court, the player can feel the concept of hitting up on the ball to make the ball rotate forwards.

Use the frame of the racquet

One of the easiest ways to introduce spin is to instruct the player to hit the ball with the frame of the racquet. For topspin, ask the player to try to hit the incoming shot up to the sky with the upper part of the frame. Then instruct the player to use the same swing but to brush behind the ball as opposed to hitting with the frame. This concept of brushing up can can be emphasized by having the player stand very close to the net and hand feeding balls right up in front of him. The player on the other side will have to swing up on the ball to avoid hitting the net with his follow through.

OTHER SPIN DRILLS

Once the players are able to hit the ball with different spins, use the following drills to perfect their control of spin.

Slice

Instruct players to rally hitting only slice. As they improve, they can rally trying to keep the ball past the service line, then, they can alternate between shots bouncing before the service line and past the service line.

Topspin

Ask players to rally hitting only topspin. As the players become better, they can alternate hitting one flat shot, one shot with slight topspin and one shot with maximum topspin.

Topspin and slice

Have player rally alternating one slice and one topspin shot.

Low, high, very high

With the same racquet head speed, the players rally trying to hit one ball low over the net, one high over the net and one very high over the net. The players will have to hit the ball with incremental amounts of topspin to keep it in the court. Make sure the swing speed remains high and constant.

Long, middle, short

Players should rally crosscourt hitting a deep shot, an angle just past the service line, and an angle landing before the service line. Just as in the previous drill, the players will have to hit the shots with incremental amounts of topspin. Make sure the swing speed stays constant.

Developing a feel for different types and degrees of spin is the first step toward gaining solid control over your shots. The next step is to understand how to use this control and stroke variety to become a better player.

CONCLUSION

As one can see, an effective tennis practice has to be structured. The basic strokes, forehand, backhand, volleys, overhead, serve and return, need to be further subdivided to include all the shots a player might need during a match. This is key to developing better weapons for battle – stroke flexibility. This is not always easy to do if we do not plan ahead. We all have drills that we tend to use over and over, and it is very easy to neglect different areas of the game. Moreover, players have a tendency to like the drills that they can do well and hate drills that they have a hard time executing. But, to develop better players it is very important to identify those areas of difficulty and work more on them.

REFERENCES

Giffenig, E. (2013). Developing High Performance Tennis Players. Germany: Neuer Sportverlag.

RECOMMENDED ITF TENNIS ICOACH CONTENT (CLICK BELOW)

TennisiCoach

Relationships between the performance of the forehand groundstroke and the one-hand or two-hand medicine ball throw

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ABSTRACT

The goal of this research was to study the relationships between maximum ball speed post-impact in the forehand groundstroke and the performance of the one-hand and two-hand medicine ball throw. Ball speed in the forehand groundstroke significantly correlated with the values obtained for lateral one-handed throw (0,40 - 0,59), but not two-handed throw (0.01 - 0,29). These two different types of lateral throws would allow diverse training goals and should, according to the results of the present study, be used in distinct and specific moments of the training periodisation.

Key words: baseline, ball speed, physical conditioning, correlational analysis

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INTRODUCTION

Based on the style and touch while played with wooden racquets, tennis has come into what Kovacs (2010) defines as the « physical era ». Generating power or high ball speeds has become a determining factor in the success of tennis at elite level (Pugh, 2003). After the serve, considered as the key of modern tennis play (Magnus, 1999), the forehand groundstroke has a predominant position in the construction of the point (Brabenec, 2000, Johnson et al, 2006). High performance tennis players use this stroke to dictate the point playing with power and precision to strategic zones of the court in order to overpower their opponents (Roetert, 2009). Players run around their backhand to hit with their "inside out" forehand, and the best ones are able to cover up to 85% of the court with their forehand groundstroke.

Recent studies have shown that the different rotational speeds of the hips and trunk at impact distinguish different ball speeds post-impact in the forehand groundstroke (Landlinger et al, 2010; Seeley et al, 2011). In order to improve this performance factor, Roetert et al. (2009) recommend the use of a medicine ball (MB) laterally and with two-hands (MB2) (figure 1), simulating the different positions that occur during tennis play.

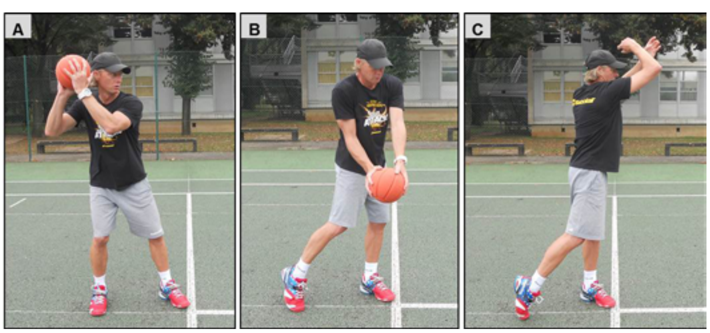

Figure 1. Lateral medicine ball throw with two-hands simulating a forehand groundstroke with a preparation phase (A), acceleration (B), and follow through (C).

These throws allow the player to improve the stroke movement while respecting the cinematic chain, especially the transfer of energy generated by the lower body towards the hitting arm. A training regime that uses these throws has shown its efficiency in improving the batting speed in baseball (Szymanski et al, 2007). However, holding the MB with two-hands reduces the degree of freedom in the dominant arm as compared with a forehand groundstroke. Besides, to our knowledge, there has not been any research that has confirmed the benefits of these throws on the speed of the ball in the forehand groundstroke. Conversely, by using a MB with a handle, which allows the one-handed throw (figure 2), Genevois et al. (2013) have shown a significant improvement in post-impact ball speed of around 11% after a 6 week training programme.

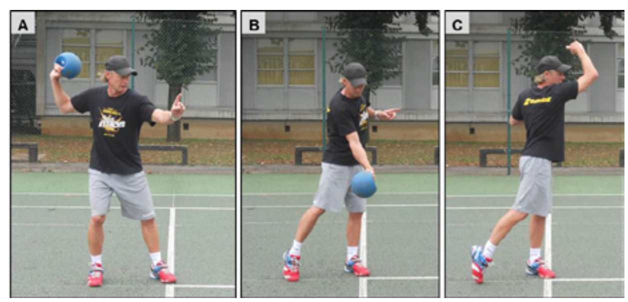

Figure 2. One-handed lateral medicine ball throw simulating a forehand groundstroke with a preparation phase (A), acceleration (B), and follow through (C).

It seems interesting to us to study the relationships between two lateral MB throwing techniques, one- and two-handed (MB2 and MB1), and the maximum ball speed post-impact in the forehand groundstroke in order to determine the pertinence of their use with the goal of improving the performance of the forehand groundstroke

METHOD

After a standardised warm up, 20 adult tennis players (age: 23.3 ± 4.2 years, height: 179.1 ± 0.07 cm, weight: 69.3 ± 7.7 kg, years of experience: 11.6 ± 5.5 years, tennis: 2.5 ± 1.04 hours, conditioning: 1.7 ± 1.3 hours, ranking between 30/4 and 2/6) performed a performance test of the forehand groundstroke and the MB1 and MB2 throws, as part of an evaluation programme of their training regime.

The performance test of the forehand groundstroke (Genevois et al., 2013) consists of measuring the ball speed post-impact of 10 crosscourt shots played at maximum speed using a radar (SR 3600; Sports-radar, Homosassa, FL, USA). The mean of the two fastest strokes played inside the court was used for the statistical analysis.

The lateral MB one and two-handed throw test was performed randomly with medicine balls of 1.5, 2, 3, 4, and 5 kg of weight. A 2 m wide target was drawn on the ground of the opposite court to direct the throw; the crosscourt positioning of the target allowed for a throwing angle close to 45° (figure 3). 3 attempts were made for each weight. The longer distance achieved within the limits for each weight of MB and for each throw type was used for the statistical analysis.

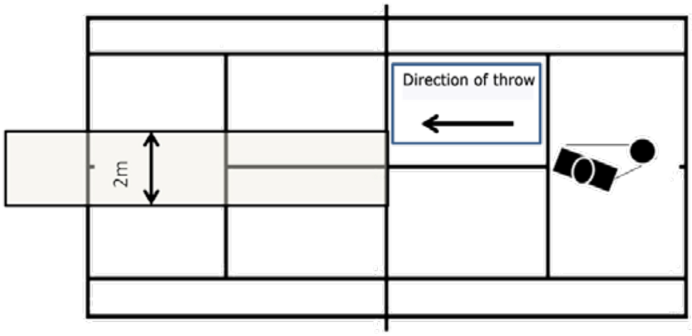

Figure 3. Experimental conditions for the medicine ball throws. Example of a two-handed throw (MB2).

Pearson correlation coefficients (r) were calculated to determine the different relationships between maximum ball speed in the forehand groundstroke and the maximum distance achieved in the throws MB1 and MB2 for each weight. Statistical analyses were performed using the computer package SPSS 11.0 (SPSS, Inc., Chicago, IL, USA), and the significance value was set at $p \leq 0.05$.

RESULTS

Regardless of the throwing technique, performance diminished with the increase of the mass of the MB (Figure 2). Distances achieved with MB1 were superior to those with MB2 regardless of the weight (figure 4).

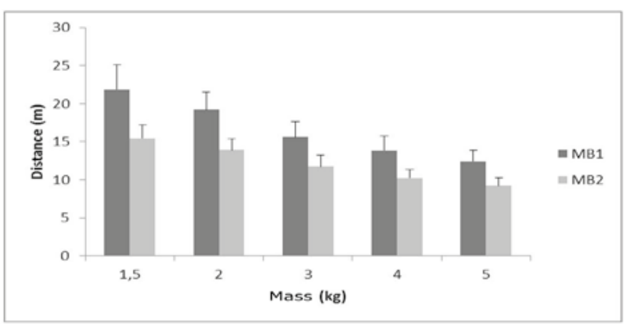

Figure 4. Mean results (± typical deviation) achieved with lateral one-handed (MB1) and two-handed (MB2) medicine ball throws with different masses.

Correlation coefficients between maximum ball speed in the forehand groundstroke and the distances achieved for each mass of MB are shown on table 1. All the correlations were significant between the forehand groundstroke speed and the maximum distances achieved with MB1, whereas no significant correlation was observed between forehand groundstroke speed and maximum distances with MB2.

	MB1					MB2				
	1,5 kg	2 kg	3 kg	4 kg	5 kg	1 , 5 kg	2 kg	3 kg	4 kg	5kg
FH	0.59 **	0.43 *	0.44 *	0.45 *	0.57 **	0.24	0.23	0.01	0.29	0.16

*Table 1. Correlation coefficients between ball speed in the forehand groundstroke (FH) and distances achieved in the lateral one-handed (MB1) and two-handed (MB2) throws for each mass used with *$p \leq 0.05$ y ** $p \leq 0.01$.*

DISCUSSION

The main results of this study have shown on one-hand that, for each mass, the distances achieved with MN1 have been superior to the ones achieved with MB2 and, on the other hand that the lateral MB one-handed throws have significantly correlated with the performance of the forehand groundstroke.

The shorter distances achieved by the two-handed MB throws could be explained due to the less length of the lever on this type as compared to the one-handed throw, which would imply a shorter trajectory to accelerate the ball prior to its projection (figure 5).

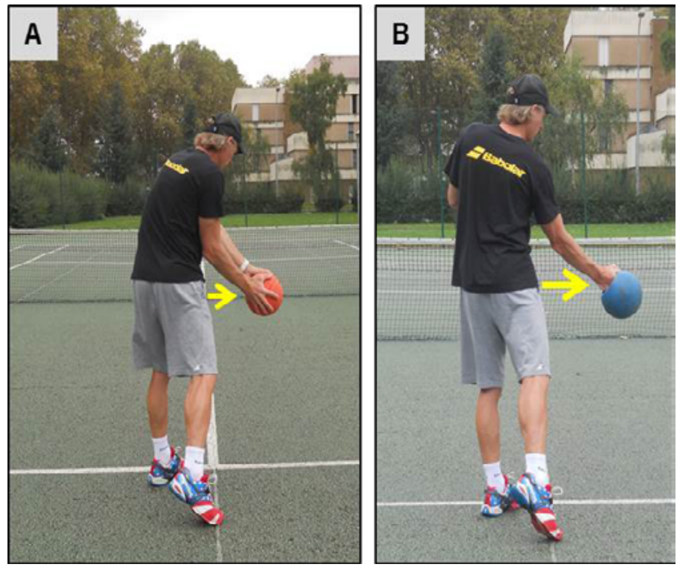

Figure 5. Length of the lever arm is reduced with two-handed throws (A) when compared to one-handed throws (B).

Thus, the fact of holding the MB with two-hands would considerably limit the contribution of the shortening/lengthening cycle of the back muscles, and the results obtained with the two-handed throws would therefore be more representative of the speed generated by trunk rotation (Ikeda et al., 2007; Ikeda et al., 2009). In fact, in order to do this, the MB is located closer to the vertical rotational axis as compared to the one-handed throw, reducing in this way its moment of inertia and favouring a greater rotational speed for a given mass. On the other hand, the lack of a significant relationship between the results of the two-handed throws and the forehand groundstroke (Table 1) could be explained due to the limited contribution (10%) of the trunk in the generation of racquet speed in the forehand groundstroke (Elliott et al., 2009). Furthermore, at impact in the forehand groundstroke, Elliott et al., (1997) have shown that the racquet speed is generated mainly both by internal rotation (40%) as well as horizontal flexion of the arm (34%). A split of the contributions of trunk/arm could happen in the case of the one-handed MB throw. This cinematic identity could explain the significant relationships found in the results obtained among the forehand groundstrokes and the one-handed throws (Table 1). Indeed, the way of holding the MB would allow for more freedom and movement amplitude of the arm which would be very similar to the impact of the forehand groundstroke.

As per the periodisation of training, these results allow to better define the goals of improvement related to the use of one-handed or two-handed MB throws. The two-handed throws should be used to improve the explosive rotation of the trunk. A higher trunk rotation speed contributes to an increase of the speed of the back forward and, therefore, of the racquet at impact (Seeley et al, 2011). However, the lack of direct relationships between the forehand groundstroke results and the two-handed MB throws makes it recommendable to use these drills during the general preparation phase of the player.

Indeed, the lesser degree of freedom of the dominant arm reduces the contribution of the anatomical rotations of the arm during the movement, reducing the possibilities of specific transfer to the movement of the forehand groundstroke. As per the one-handed MB throws, they allow to simulate the advantage of the coordination of the forehand groundstroke in order to transfer the improvements to the movement, this would justify the use of these drills during the specific preparation phase of the player. Besides, the one-handed MB throw could be included in the tennis specific physical tests protocols as an evaluation test representative of the performance of the forehand groundstroke.

The results of this study should be used with caution due to the characteristics of the sample, adult amateur players, and could not be generalised to the overall tennis population. It would then be needed to enlarge this research by using female tennis players, players of better level of play, and junior players of specific age groups.

CONCLUSION

The results of the present study have shown that the ball speed post-impact in the forehand groundstroke correlates significantly with the distance achieved with the lateral one-handed medicine ball throws, and no relationships were shown with the two-handed medicine ball throws. Therefore, the two-handed medicine ball throws could be planned mainly during the general preparation phase of the player. whereas the one-handed medicine ball throws could be planned during the specific preparation phase of the player.

REFERENCES

Brabenec J. (2000). Why the forehand is a key stroke? ITF Coaching and Sport Science Review 21, 11-13.

Elliott, B., Marsh, T., & Overheu, P. (1989). A biomechanical comparison of the multisegment and single unit topspin forehand drives in tennis. International Journal of Sport Biomechanics 5, 350-364.

Elliott, B., Reid, M., & Crespo, M. (2009). Technique development in tennis stroke production. Valencia, Spain: ITF Publications.

Elliott, B., Takahashi, K., & Noffal, G. (1997). The influence of grip position on upper limb contributions to racket head velocity in a tennis forehand. Journal of Applied Biomechanics 13, 182-196.

Genevois, C., Frican, B., Creveaux, T., Hautier, C., & Rogowski, I. (2013). Effects of two training protocols on the forehand drive performance in tennis. Journal of Strength and Conditioning Research 27, 677-682.

Ikeda, Y., Kijima, K., Kawabata, K., Fuchimoto, T., & Ito, A. (2007). Relationship between side medicine-ball throw performance and physical ability for male and female athletes. European Journal of Applied Physiology 99, 47-55.

Ikeda, Y., Miyatsuji, K., Kawabata, K., Fuchimoto, T., & Ito, A. (2009). Analysis of Trunk Muscle Activity in the Side Medicine-Ball Throw. Journal of Strength and Conditioning Research 23, 2231-2240.

Core fundamentals in tennis

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ABSTRACT

This article focuses on the importance of incorporating core stability exercises in to a tennis player's work out program. It concentrates on the function of the core, exercise examples and why it is specific to improving tennis performance and injury prevention. Exercises are taken from My PocketCoach (2012) to highlight ways to improve this area and demonstrate exactly how to train the core. Movement in tennis begins, and ends at the core of the body.

Key words: core, core stability, balance, injury prevention

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INTRODUCTION

Tennis is a unique sport whereby players are constantly adjusting and adapting to each ball received. In tennis, there is no guarantee that two balls will be received in the same way, demanding a player to consistently change direction and modify their position in relation to each ball. Tennis is played on various surfaces which alters the way in which a tennis player moves and responds to a ball. Quicker surfaces such as a hard courts command players to prepare more rapidly than perhaps a slower court, like a clay court would and thus in turn changing their movement patterns.

Tennis demands a player to employ multi-directional movement patterns that can be dictated by the style of player or opponent. "Upper and lower core strength training provides a stable three dimensional power platform from which the extremities can work during multi-planar, multi-joint and multi-muscle activities that involve acceleration and deceleration forces" (Petersen, 2005, p 98). Upper and lower extremities work together during tennis strokes and movement patterns to ensure that a player arrives to the ball on time, balanced and in the best position possible to hit the ball. The extremities move at contrasting speeds and in different directions, making it extremely important to ensure the foundation of the movement is strong to allow for synchronisation of different movements to occur. Movement in tennis begins, and ends at the core of the body.

The 'core' refers to the base layer of muscles within the body where they inter-connect from the spine to the shoulders, pelvis and back. Core stability describes the strength and activation of the muscles that support the central region of the body, allowing range of motion in the arms and legs and the transfer of power. Without strengthening these muscles in the trunk of the body, the transfer of power and the creation of fluid movement will be hindered. It is these deeper muscles, that when functioning successfully, allow tennis players to recover and hit optimal shots. During activity these muscle kick in to support the lumbar spine and provide stability to the pelvis and lower back to generate energy and force that in turn creates movement. It is vital for an athlete that these muscles are strong in order to increase range of movement and decrease the likelihood of injury.

My PocketCoach gives players the ability to focus on exercises that aid strengthening of the core area and highlights the significance of having a strong core. Activation of these muscles is not visible and therefore the technique of the shot and the movement of the extremities often overshadows the intricacies of the core. At a subconscious level, both balance and coordination is being practised when completing exercises on unstable surfaces, making activation of the core muscles instinctive(Adapted after Petersen et al., 2004). My PocketCoach not only educates players of the importance but also provides one hundred exercises to promote strong core stability.

MY POCKETCOACH EXERCISES/CORE EXERCISES

Exercise 1: The 'Seated Diagonal Torso Twist'.

This is a very relevant exercise to tennis, imitating the rotational movement of a groundstroke. This exercise is to be performed in a controlled manner and challenges the athlete to stay balanced while twisting sideways, emulating the action of a groundstroke, while balancing on a ball. The twisting of the torso while on the ball, an unsteady surface, means that the core muscles are forced to activate in order to stabilise the movement; otherwise, the athlete's action would not be smooth and would cause loss of balance and in turn the athlete would topple over. With the added resistance of the medicine ball, the upper body is being trained to work with the core muscles activated, exactly what is necessary when hitting tennis strokes. By using the ball as part of the exercise the core muscles are emulating the activation that would be present during the coiling and uncoiling of the body during a groundstroke on court. It is imperative to practise and work on this movement because it is evident in every groundstroke, despite the player's technique. According to Vera-Garcia et el completing exercises on unstable surfaces has been proven to increase muscles activity; in this exercise the ball provides the unstable surface (Vera- Garcia et al., 2000).

Figure 1. and 2. Starting and rotated position of the 'Seated Diagonal Torso Twist'.

Exercise 2: 'Sit Downs with Medicine Ball in Hand'

This exercise looks at the importance of core stability when practising movement overhead. This is essential in strokes such as the serve and the overhead smash. In this exercise the abdominals are lengthened and shortened throughout the exercise, very similar to the action of overhead shots. The core muscles are crucial in allowing the server to align themselves as throughout the service motion the abdominal and core muscles contract and lengthen to support the spine as it bends backwards to allow the upper body to position itself accordingly (Roetert and Ellenbecker, 2007). It is important to recognise that core stability is important as a base in all strokes.

When teaching tennis to beginners, one of the main struggles is to hit a moving ball, and even harder when overhead. Players suffer with coordinating the movement of their body to reach the contact point of the ball; often players lose balance and struggle to keep technique. This exercise enables the player to work on improving actions overhead while maintaining balance.

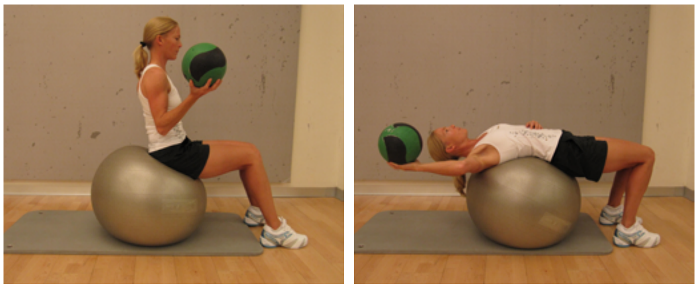

Figure 3. and 4. ´The Supine Bridge & Upper Torso Twist Holding a Ball´.

Exercise 3: ´The Supine Bridge &Upper Torso Twist Holding a Ball´

The Supine Bridge & Upper Torso Twist Holding a Ball exercise tests the athlete's ability to perform exercises while in the bridge position. While lying, with core muscles switched on and feet on the ball, the exercise demands an athlete to rotate slowly from one side to the other while maintaining posture and balance. This is a challenging exercise because the athlete is performing the exercise on an unstable base and then moves in a rotational way with the added weight of the medicine ball. It is important to remain in a consistent position, with core muscles activated, in order not to strain the spine or surrounding muscles. It is also trains the players to sustain their strength through the contact point as the exercise requires the players to twist as if they are preparing for a stroke and then follow through. Quick activation of the core supports the lumbar spine and provides stability to the pelvis and lower back to generate energy to create movement.

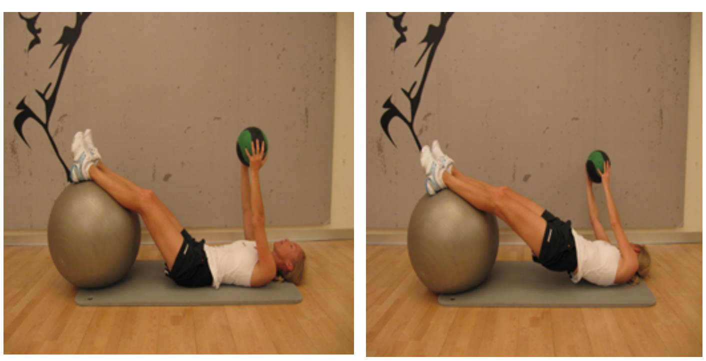

Figure 5. and 6. 'Sit Downs with Medicine Ball in Hand´.

CONCLUSION

The impact of core stability training in a professional athlete is imperative to their athletic performance and injury prevention. It is vital to include this type of training in a program to ensure that a solid base is acquired.

Points are often lost by players being out of position or off balance when they hit the ball. A factor playing a large part of this is the lack of core stability to allow the player to recover or remain in control of the body in order to reach the next ball. Tactically one of the fundamental ways of winning the point is to hit the ball to a place where the opponent is going to struggle to hit the shot comfortably or in their optimal position.

Core stability is vital to preventing injury and is important to be included in a tennis player's fitness program. Core stability contributes to the range of movement in the upper and lower extremities and protects the spine by providing support during activity, this is vital in tennis. Every shot in tennis requires the player to activate their core muscles to make sure that they control their action and recover quickly and effectively.

REFERENCES

Petersen, C. (2005). Fit to play- practical tips for faster recovery (part 2). Medicine & Science in Tennis. 10(2), August 2005.

Petersen, C., Sirdevan, M., McKechnie, A. & Celebrini, R. (2004). Core connections 3-dimensional dynamic core training (balls & stretch bands). In: C.W. Petersen. Fit to Ski: Practical Tips to Optimize Dryland Training and Ski Performance. Vancouver: Fit to Play/CPC Physio. Corp 267-281.

Roetert, P.E., & Ellenbecker, T. S. (2007). Complete Conditioning For Tennis. Champaign, IL. Human Kinetics.

Vera-Garcia, F., Grenier, S. & McGill, S. (2000). Abdominal muscle response during curl-ups on both stable and libile surfaces. Physical Therapy 2000, 80(6): 564-569.

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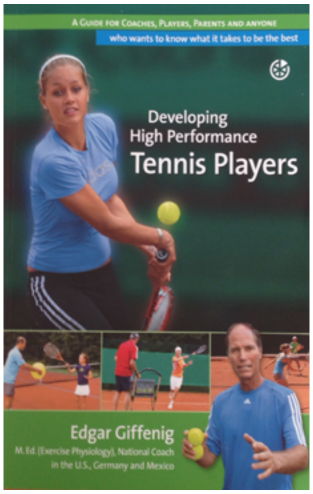
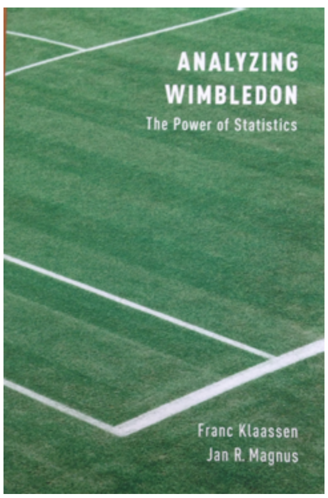
Recommended books



DEVELOPING HIGH PERFORMANCE TENNIS PLAYERS

Author: Edgar Giffenig. Language: English. Type: 285 page book. Level: Beginner to advanced level. Year: 2013

Developing High Performance Tennis Players by Edgar Giffenig is a guide to help parents, players and coaches navigate through the complexities of high level tennis competition and the long term development process. The book summarises and resolves some of the most frequently asked questions by parents, giving them clarification and answers to even the most intricate questions. Coaches are equipped with ideas for new drills and ways to make practise more effective and fun demonstrating how to vary and adapt to each player's needs and level. The drill library covers a vast area of expertise including tactical, technical and psychological elements to give a well-rounded and comprehensive insight into the demands of high level sport. This is an essential tool for all those who want to take their game, or knowledge of the game, to the next level. It is fundamental to any level player keen not only to improve, but improve quickly.



ANALYZING WIMBLEDON

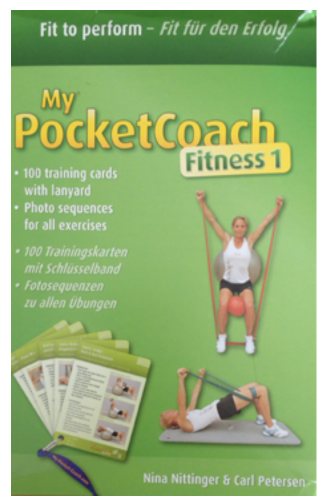
Authors: Franc Klaassen and Jan R. Magnus. Language: English. Type: 252 page book. Level: All levels. Year: 2014

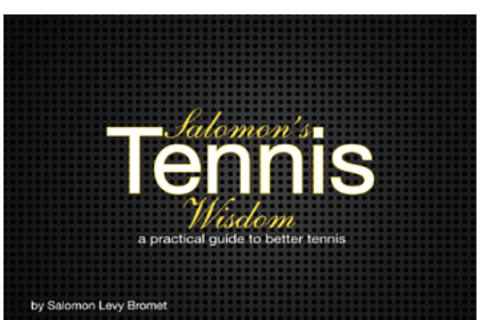
This is a book combining tennis and statistical knowledge. It is intended to demonstrate the power of, and contextualise statistics. It is an insightful link between the mathematical, physical and psychological elements of the game. The book investigates how accurate tennis predictions can be and details the challenges and variations of forecasting, before and during a match. Human behaviour is also examined and the psychological reasons behind why a tennis player may change their behaviour during a match is explored. An essential book for, not only a reader with an interest in mathematics and statistics, but also for an audience that is intrigued by the game of tennis and looking for a new perspective.

MY POCKETCOACH

Authors: Carl Petersen and Nina Nittinger. Type: Fitness manual and cards. Language: English and German. Level: All levels. Year: 2013

The innovators of My PocketCoach have created a new training system of training cards for on-the-go use; making fitness easily accessible and manageable when on the road. Not only useful when travelling, these training cards offer progressive exercises to help train athletes over a period of time to improve their fitness and core stability. Essential exercises are shown to help prevent injury and increase core strength. The exercises are explained in two languages, English and German, and are complemented by pictures that depict the start and end position of each exercise. It is a dynamic new series to enhance your training routine and create variety within workouts. With one hundred different exercises My PocketCoach will assist in progressing athletic level and enjoyment ensuring the work outs stay structured and diverse.



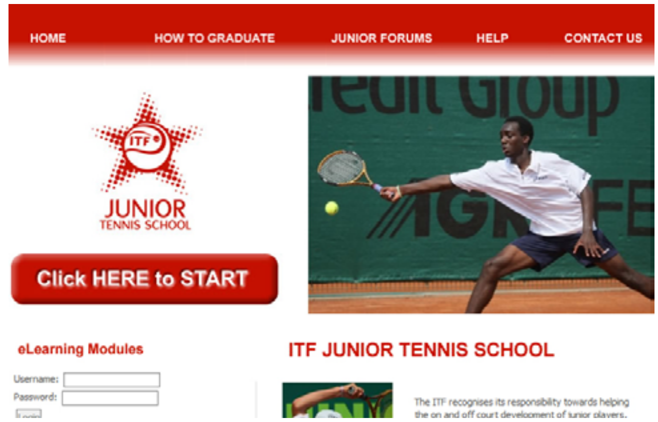


SALOMON´S TENNIS WISDOM; A PRACTICAL GUIDE TO BETTER TENNIS

Author: Salomon Levy Bromet. Type: PDF. Language: English. Level: Beginners. Year: 2013

This is a collection of analogies to simplify some of the difficulties in technical coaching. It is designed to make tennis fun and more stimulating for the player. Comparisons are clearly illustrated to help all ages and levels visualize mental images to better understand instructions. It is an important tool for any coach wanting to keep players interested and attentive.

Recommended web links



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