



Welcome to Issue 14 of the ITF Wheelchair Tennis Coaches Review. In this issue Louis Lamontagne-Muller continues his series of articles on doubles. Phillip Newbury analyses the elite men's wheelchair tennis game and Horst Guentzel evaluates the fitness testing that has been done with some Japanese players. Tjasa and Ales Filipcic have undertaken some interesting analysis of patterns of play in wheelchair tennis.

Coach education in wheelchair tennis remains a priority for the ITF. Following the Invacare World Team Cup in Brazil twenty-five coaches attended the ITF Wheelchair Tennis Coaches Workshop. Presentations were given by Greg Crump (AUS), Dan James (USA), David Sanz (ESP), Severine Tamberero (CAN) and Aad Zwaan (NED).

New resources are continually becoming available. Tennis Canada have recently produced a Wheelchair Tennis Doubles Manual written by Louis Lamontagne-Muller. Articles on wheelchair tennis regularly feature in mainstream tennis coaching publications. French National Coach Yann Maitre is featured in Issue 39 of 'La Lettre Du Club Federal Des Enseignants Professionnels' produced by the French Tennis Federation. In Issue 38 of the ITF Coaching and Sports Science Review there is an article on Travelling on the NEC Wheelchair Tennis Tour. This publication is available in English, French and Spanish. On the ITF Coaching weblet ([www.itftennis.com/coaching](http://www.itftennis.com/coaching)) there are two presentations on wheelchair tennis.

Several coaches have been involved in various development projects for the ITF. Any coaches interested in being involved in Silver Fund or other development work should submit their curriculum vitae to the ITF. Marta Balint is the co-ordinator for this project ([Marta.Balint@itftennis.com](mailto:Marta.Balint@itftennis.com)).

Finally I would like to congratulate David Sanz on being voted 2005 IWTA Coach of the Year Award. The award was presented at the Invacare World Team Cup in Brazil.

If you have any questions related to coaching please do not hesitate to contact me.

Kind regards,



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David Sanz (ESP) presenting at the 2006 ITF Wheelchair Tennis Coaches Workshop in Brazil



### **IWTA Coach of the Year Award: David Sanz (ESP)**

The International Wheelchair Tennis Association is pleased to announce that David Sanz has been voted the 2005 International Wheelchair Tennis Association (IWTA) Coach of the Year. David is the National Coordinator for Wheelchair Tennis at the Federacion Espanola de Disminuidos Fisicos (Spanish Federation for the Physically Disabled) and member of the Wheelchair Tennis Committee of the Spanish Tennis Federation (RFET).

For many years David has carried out the vast task of promoting wheelchair tennis in Spain, organising talks, clinics and exhibitions. David coordinates all the championships that take place in Spain and maintains by day the National Classification of wheelchair tennis.

David is also the Area Director of Teaching and Research of the RFET and organises annual courses in Madrid and Barcelona on technical issues in wheelchair tennis. For years David has collaborated with the ITF in the IWTA Wheelchair Tennis Coaches Commission and has carried out many courses in different countries.

#### **Achievements:**

David is the manager of the national teams that participate in the Invacare World Team Cup and the Paralympic Games. In recent years he has achieved a great progression with his players as much at an individual level as with team results.



## Playing as a Team: Minding Style In Training Sessions

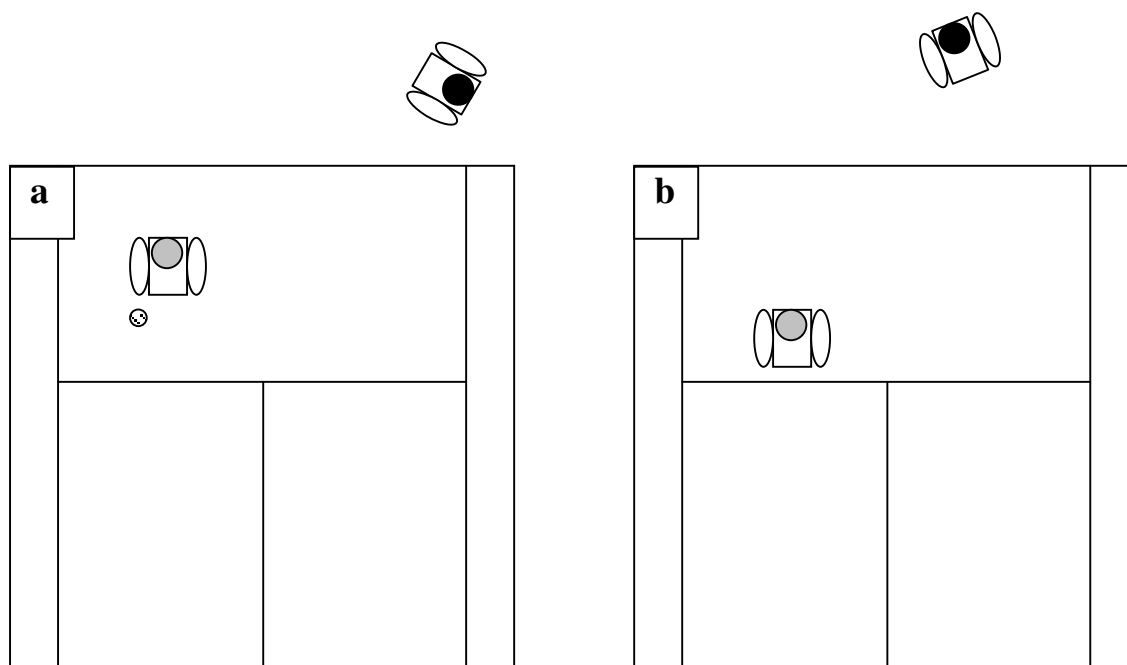
Louis Lamontagne-Müller



*Louis Lamontagne-Müller is a former Canadian National Coach. Louis, is the author of a book on wheelchair tennis doubles. He has personally coached Isabelle Müller (SUI), Karine Erath (SUI), Helene Simard (CAN), Claude Brunet (CAN) and Yan Mathieu (CAN). He is presently working on a PhD in psychology on the attitude toward disabled people at the University of Fribourg in Switzerland.*

As you might have heard by now, I have finally finished the doubles manual that I was working on. Unfortunately, I could not include all that I wanted because it would have made it not-so-user-friendly, and lengthy. Details on how to purchase the manual can be found later in the Review.

What I want to do here is show an example of how important it is to know what the style of the team you are training is so that it can be a part of your plan for the training sessions. In the manual (pp. 4-5), I refer to three basic team styles: Backcourt, All-Court and Net Player. Only the last two have the option of sending a player at the net, and that can make a difference when you are training a game situation where a player has to come in. The example we are going to use here is simple: a closed situation where a player receives a short ball and is forced to come in (see figure 1, a and b).



**Figure 1 – (a) a player gets a short ball during a rally and has to come in, and (b) stay in.**

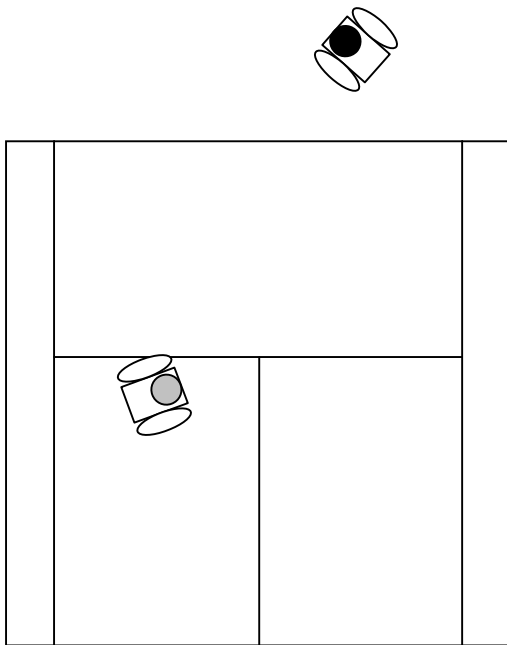
Except for the fact that the opponents could hit a winner or make a mistake, two other situations are possible: 1) hit to the back court player or 2) hit to the net player. These two possibilities will be examined while considering the three team styles.

Backcourt Team:

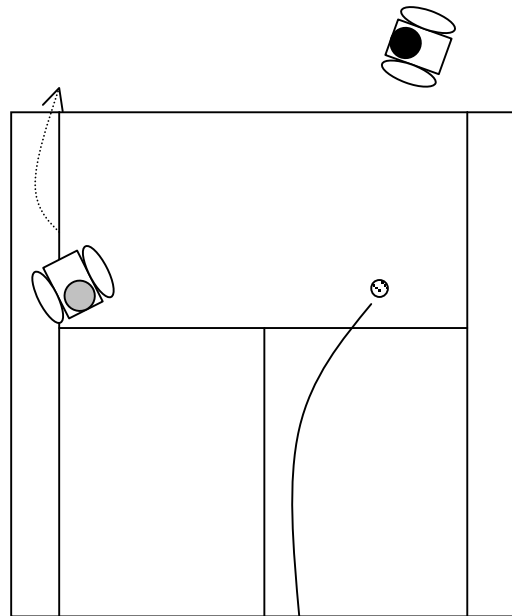
If the team who had a player forced to come in is a **backcourt team**, they want that player back behind the baseline as soon as possible. UNLESS there is an obvious opportunity to win the point, their aim should be to do just that on the following shot. Therefore, if the ball is hit to the partner (backcourt player), then he/she should hit a high, looping ball on the next shot so that his/her partner (the net player) has time to move back behind the baseline (see figure 2, a, b and c).



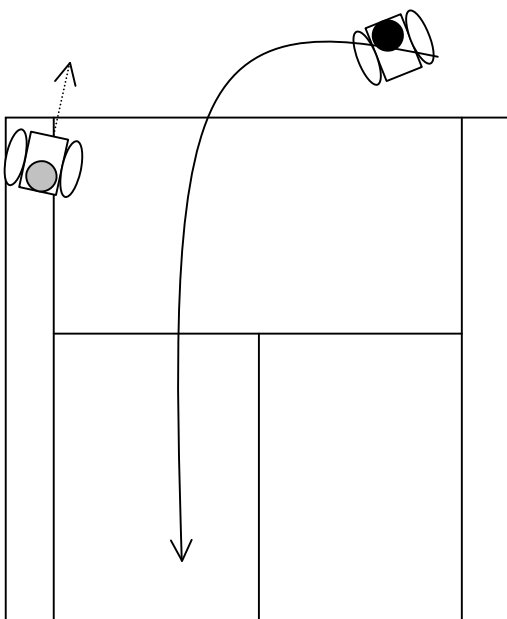
Photograph: Ando Akira



**Figure 2a** The net player starts to turn when he sees the ball going towards the partner (before the ball passes the net.)



**Fig 2b** The net player keeps moving back as the ball goes toward the partner.



**Figure 2c** – Backcourt player hits a high to buy time for the partner.

If the next ball is hit back at the net player, UNLESS there is an obvious opportunity to win the point then he/she should try to aim at the sliced backhand of one of the opponents while baiting for the lob. If the opponents lob, the net player has plenty of time to move back since his/her partner will also play a high ball (following the opponent's lob). If they play back at him/her one more, then he/she is in a good position to volley a winning shot (being closer to the net and receiving a ball from a sliced backhand). If they play back to the partner (without lobbing), he/she just needs to get out faster because of her tighter net position, but with the help of a higher-than-usual ball from the partner in the backcourt, he/she should make it.

### All-Court Team:

If the team who had a player forced to come in is an **all-court team**, they want that player back behind the baseline as soon as possible if he/she is not their net specialist. Therefore, they can train to do the same as a backcourt team would do in this situation. But if the player now at the net is a player whom they want to be there, they might try to keep him/her there as long as they are dominating the point. Therefore, if the ball is hit to the partner (backcourt player), then he/she should hit according to the opening created or the game plan agreed beforehand. The same goes if the ball is hit to the net player.

### Net Player Team:

If the team who had a player forced to come in is a **net player team**, they want that player back behind the baseline as soon as possible if he/she is not their net player. Therefore, they can train to do the same as a backcourt team would do in this situation. But if the player now at the net is the net player, they try to keep him/her there as long as they are rallying or dominating the point. Therefore, if the ball is hit to the partner (backcourt player), then he/she should hit according to the opening created or the game plan agreed beforehand. The same goes if the ball is hit to the net player.

### *Conclusion:*

The style of the team will dictate a lot of decisions when it comes to movement, recovery and shot selection. Make sure you include that variable within your training sessions so that you train a **TEAM**, not just players.



Photograph: Ando Akira

## Men's Elite Wheelchair Tennis: How it's played and what can we learn from it?

Philip Newbury (GBR)



*Philip Newbury graduated from Loughborough University with a degree in Sports Science and Physical Education. A winner of the jointly awarded Lawn Tennis Association, British Tennis Coaches Association Darren Toop Young Coach of the year award in 2003/4 Phil recently passed the LTA's Performance Coach Award, currently the highest coaching award in Great Britain.*

*Phil gained his experiences in wheelchair tennis through working with Janet McMorran who achieved a career high ranking of No.6, captaining the Great Britain Junior Team at the 2005 Invacare World Team Cup in the Netherlands and through travelling with Jayant Mistry to the Swiss Open a part of the NEC Wheelchair Tennis Tour which formed the basis for this article.*

*Phil currently works at Loughborough University Teaching the Applied Sport Science module in tennis with both year 1 and year 2 students as well as working in the coaching programme at the near by Loughborough Town Tennis Club.*

### Introduction

During a trip to the 2005 Swiss Open ITF 1 wheelchair tennis event, a part of the NEC Wheelchair Tennis Tour, the decision was made to gain some insight into how the game was played between players in the top twenty in the world rankings. By doing this not only would it help to coach a player at this level, it should also give an insight into how to best help developing players reach this level of competition.

I hoped to go somewhat towards answering some key questions about the way the game is played so that the skills needed to exist at this level can be identified and developed within training that maximises the use of time and replicates the game accurately.

### Method

Matches between top twenty players were charted using a tennis court diagram to plot the location of the first bounce from serves, ground shots and volleys. Missed shots were also marked with a direction line, as were circled winners and underlined shots which winners were hit off. One such court used to chart two games looked like fig1.

Serving was marked on a separate sheet in two formats; serve direction by game and by score in which the direction was marked according to whether the score was 30-0, 30-15 etc.



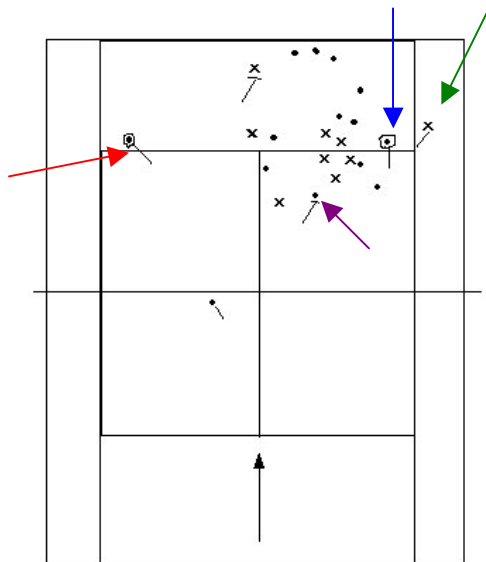


Fig 1. An example of a completed chart, showing shots from two games. The end the player was hitting from is shown with the large arrow. Also shown are:

Cross-court forehand winner marked with the red arrow.

Line forehand winner marked blue arrow.

Cross-court backhand miss wide – green arrow.

Opponent crosscourt winner off short forehand – purple arrow

There is also a missed crosscourt forehand in the net and an opponent winner of a centrally hit backhand.

## Results

The results suggested that 73% of the shots were played towards the backhand side of the opponent, yet the top twenty players studied also managed to hit 55% of their shots on the forehand.

68% of all winners were hit using the forehand side, while 54% of the errors were made on the backhand. The majority of these errors would have been while hitting the backhand cross-court, which the player would attempt to do over 75% of the time.

The variation to this pattern was the switch towards the opponent's forehand side. This would occur more often than not with the forehand inside in or cross-court, however certain players displayed a higher use of the backhand down the line. When switching to the forehand side the point finished quickly (within two shots) 40% of the time, with the switching shot itself winning the point most often followed by the opponent's forehand reply and an error being the least common result.

Of all balls hit to the forehand side of an opponent 28% can be accounted for by the serve. This remained the exception when looking at service direction as the serve down the middle to the deuce court or out wide on the advantage side accounted for 89% of all serves charted during the week. 30% of the shots to the opponent's forehand side can also be accounted for by the return of serve, leaving 42% of the switches to happen in open play.

Using the 80-20 theory, designed to show where only 20% of shots in tennis land, it is no surprise to see that not only do the top players hit these areas more often than their opponents but also that shots into this area accounted for 75% of all winners and only three shots into this zone were returned as winners during the week. Fig 2 shows the forcing zone in more detail.



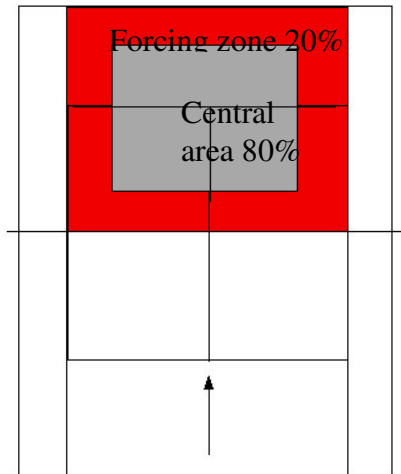


Fig 2. The forcing zone.

Shown in red the forcing zone is typically where 20% of all shots land.

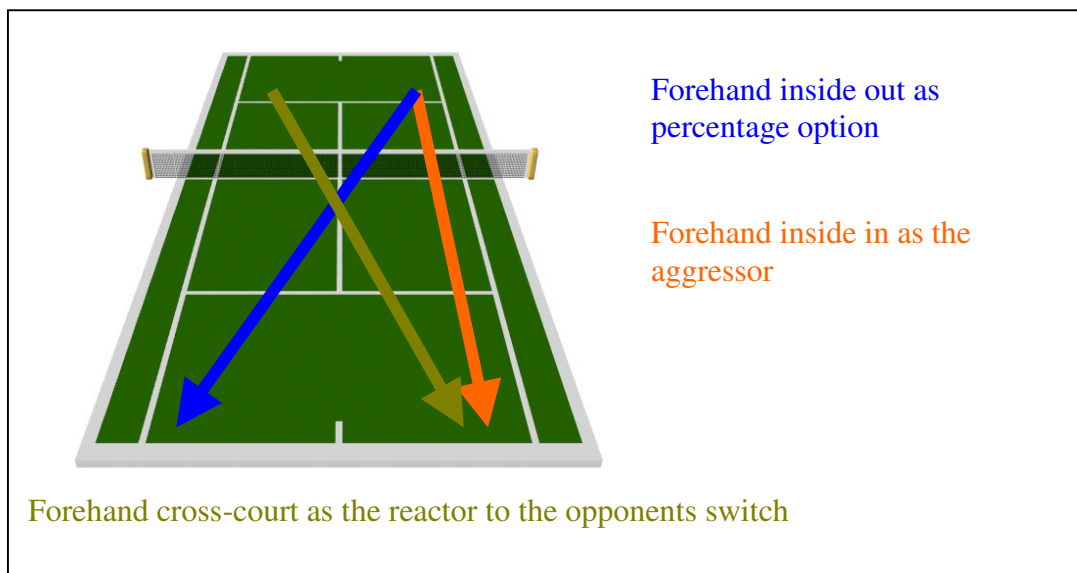
Central area shown in grey is where typically 80% of all shots will land.

Players able to pick the time and hit the forcing zone seem to have the greatest success, being able to cover the forcing zone makes players tough to beat.

## Discussion

So what does all this mean for coaching current and potential players? Training should as closely as possible represent the demands of the game. Serve and second shot training as well as return and second shot should make up a third of on court work given the immediate opportunities to win points. The serve is the only time that the players are stationary reducing their potential court coverage, therefore effective use of direction and spin with the percentage to the backhand helps to nullify any potential attack. Being able to anticipate the likely direction of the return also gives the top players an advantage when playing the second ball. Alternatively the return provides an instant chance to take control of the point. Aggressive returns to the outer twenty percent areas particularly down the line are regular point winners.

During baseline play the forehand should be developed as a weapon, both towards the backhand corner as a percentage but also the ability to switch the attack with an inside in forehand (as an aggressor) or the forehand cross-court as a response to an opponents switch (as the reactor). All of the top players on show made use of both of these forehands with the percentage varying depending on the style of play.



On the backhand side the focus should be to develop a consistent forceful shot cross-court in order to set up the forehand. Of particular importance at the top level is the use of flight, length and spins to gain much needed variation in extended cross-court rallies. It is this variation that combined with good court positioning allows these players to hit a lot of short mid-court balls but stay in the rallies.

Some of the most successful singles players are showing that they are increasingly adept at both heavy low slice shots as well as flighted top spin drives. The sole purpose of most of these exchanges is to create a ball in the middle of the court to be attacked with the forehand. Combinations of short angled backhands followed by deep forehands into the open court and deep cross court backhands followed by the angled forehand shows a great similarity to able bodied clay court play (short one side deep to the other). Given the information above it is easy to forget the backhand down the line, a risky tactic even for the group of players considered here, however, any player who could develop the disguise and consistency to make this a weapon would reap the rewards.

The use of specialist shots and improvised shots gives the top players an additional advantage. These shots include:

- Drop shots (played with more height and backspin than in the able bodied game to negate the 2<sup>nd</sup> bounce),
- Slice forehands (think squash shots),
- Smashes, bounce smashes and 1/2 smashes (a smash with the ball just above head height and wide, played with a slice action around the ball.
- Sidespin slice forehands and backhands (used when the ball coming straight at the player and achieved by swinging down and across the front of the chair).

These allow the players to react to difficult situations on court and allow players to hang in points as well as providing additional variation to the play outlined above. In developing future players improvisation is an important factor, this requires high levels of co-ordination and the ability to use the racket in different ways. Games of touch tennis and experiments requiring players to hit while holding the racket in different ways and different grips would encourage the flexibility and racket skill required.

## **Conclusion**

Knowing the game we are preparing players for allows us to make the best use of the time with have on court with them and gives them a better chance of being ready for the job in hand. By knowing the key elements of the game and the skills needed to succeed it allows us to simplify life for players rather than complicating it with relatively unnecessary information and practice. Two or three things done really well within the patterns identified from the top players would see a player maximise their ability.

## Physical components in wheelchair tennis – Report about TTC fitness test for wheelchair tennis players

Horst Guentzel (GER)



*Horst graduated from the German College for Physical Education in Leipzig. He worked for 13 years at the Research Institute for Physical Education and Sport in Leipzig in the department for training-science in speed and strength sports. During this time he worked voluntarily as a tennis coach, especially with junior tennis players. In 1990 he was appointed for one year as the national coach for youth of the former East German Tennis Federation.*

*In 1993 he went to Japan for work in a sports club. He worked as a fitness coach, consultant and adviser to College and Company Baseball teams and professional baseball players, as well as the personal coach for athletes in track and field (including the 1995 men's National Champion in the 100 m sprint; and the winner of the 1998 Asian Games in the women's high jump).*

*In 2000 he moved to the Tennis Training Centre in Kashiwa/Japan as Fitness Director. The tasks are fitness training for competitive tennis players and wheelchair tennis players including Shingo Kunieda, Satoshi Saida and Mie Yaosa.*

In February 2003 we introduced in issue 7 of the 'ITF Wheelchair Tennis Coaches Review' a fitness testing protocol for wheelchair tennis players, which are being applied at the Tennis Training Centre (TTC) in Kashiwa in Japan. The tests are based on the essential components of fitness for competitive wheelchair tennis players, which are mobility and speed in the wheelchair, racket swing speed, power, endurance and strength.

The selection and creation of the exercises came from the principle that the exercises can be carried out by all players, without limitation due to different grades/types of disability (with exceptions for Quad players), and the routines should be very similar to the demands on court.

The main components have been tested with the following tests:

- Speed in the wheelchair: baseline – net dash (measured with timer)
- Throwing speed: tennis ball throw
- Mobility in the wheelchair: T-turns (measured with stop-watch)
- Strength: grip strength dynamometer
- Power for strokes: medicine ball throws
- Power for wheelchair pushes: resistance dash (measured with timer)
- Speed endurance: 5-point fan run (measured with stop-watch)
- Endurance: 1 km run (measured with stop-watch)

At TTC we have been carrying out these tests since 2002 to monitor and evaluate the physical development of our wheelchair tennis players. 23 male and 3 female players have been tested in the period from 2002 until 2005. The tests have been carried out twice a year (April/May and October/November).

Players of all levels of play were tested. The range is from players in the top ten of the ITF wheelchair tennis rankings to players with a low national ranking.

In this analysis data is used from 76 tests of male players and 17 tests of female players. Especially the top players of TTC participated in this test regularly twice a year. Because of the low number of tests for female players, the data were not statistically analyzed.

## 2. Discussion of results

The analysis of the data shows a correlation between performance in the test exercises and the training-age of the players. For the analysis we put together in groups the results of players with 3 years training in wheelchair tennis, 4 to 6 years, 7 to 10 years, 11 to 15 years and over 15 years. With an increase in training years in wheelchair tennis, the performances in all the test exercises improve. A significant improvement is established for players after 3 years of training in wheelchair tennis. The improvement continued and especially in the speed and mobility exercises a significant improvement is found between 7 and 10 years of training. The group of players, which has been playing wheelchair tennis between 11 and 15 years, has on average the highest performance results in all 8 test exercises. For players with more than 15 years experience in wheelchair tennis there is a light decrease of level in a few of the exercises with the exception of grip strength.

A comparison of test results and ITF rankings and/or national rankings shows a significant link between ranking and level in the test exercises. The players with the highest ITF ranking also have the best physical abilities.

For the analysis we put together the test results of players in groups depend on their ITF ranking. The groupings are best 20; 21 to 50; 51 to 100; over 100.

In all the exercises, with one exception in the grip strength exercise, the average performance for the players in the first group with the highest ITF ranking has the highest level. The levels of the averages decrease continuously to lower ranked groups. The comparison of the three female players shows not such a strong correlation between the ITF ranking and performance in the test exercises as in the men's category.

In table 1 the results of every test exercise are summarized. The results of male players were put together in groups of ten results. The table shows the range of the results. The groups are not specified in relation to the nature of the disability. After 4 years experience with the use of the test, the value of the exercises for the evaluation of the physical development for the wheelchair tennis players can be more clearly determined.

The test exercises baseline-net dash, T-turn, 5 point fan run, ball toss, resistance run and 1 km run are very meaningful for the evaluation of the physical factors for wheelchair tennis players.

We believe that the current top level of our players in these exercises meets the necessary physical standards for top male tennis players. Especially in an individual long term progression, we have good experience to evaluate the physical level for example after a longer training period before the tournament period. The 5- point fan run and the T-turn are very informative for a good preparation. Good individual levels in these exercises before tournaments could be confirmed with good results in tournaments and are supporting the self-confidence of the players.

With systematic and regular physical training the players developed their physical abilities very progressively in the first one or one and a half years. It could be recognized in all of the exercises. Then the progression in the development trajectory became slower. In a few exercises these performances of the first year were

orientation to keep the level in the next years. In other exercises, especially in the exercises for speed and mobility in the wheelchair a further but slower improvement was still possible

As mentioned above, the idea with the selection of the exercises was that all wheelchair tennis players can carry out these exercises and a comparison of the results between the players should be possible. In the T-turn and the ball toss exercises limitations are recognizable, caused by different kinds and grades of disability.

The medicine ball throw does have not the expected close correlation to the ball toss and the serve. Also this exercise for practical use during the test on court is a little complicated for the players, because they have to move for the test in and out of their wheelchair.

The grip strength test has not much correlation to the performance in wheelchair tennis. This exercise indicates more generally the strength in fingers and forearms.

### 3. Resume

The inauguration and continuous implementation of the fitness test in the training of the wheelchair tennis players at TTC led to more purpose and variety in fitness training and supported the motivation and competitiveness of the players. The evaluation of the player's physical state becomes more specific and steady. The goals for the next cycle can be set more exactly.

A few details of the test will be modified. When the number of tests data is sufficient it is planned to create an assessment table. For coaches and players with interest on the test results, we can give more detailed information and they can look at the files.





Table 1:

**Summary: TTC Wheelchair Tennis Fitness Test - Men**

	ball toss	Medicine Ball toss	grip right	grip left	dash	T-turns	r-r 1	r-r 2	r-r 3	5-point	1 km
		2 kg					10 kg	15 kg	20 kg		
	m	m	kp	kp	sec	sec	sec	sec	sec	sec	min
best result	41.2	12.0	74.4	65.0	3.09	13.0	1.78	1.95	1.99	25.6	03:41
average of best 10 results	36.0	11.1	70.8	61.0	3.21	13.5	1.92	2.04	2.17	26.2	03:47
average of 11. to 20. results	28.9	9.7	60.8	54.1	3.37	14.1	2.01	2.15	2.31	27.3	04:05
average of 21. to 30. results	24.7	9.0	55.2	50.9	3.46	15.2	2.09	2.30	2.47	28.3	04:25
average of 31. to 40. results	22.8	8.6	53.5	48.2	3.59	16.6	2.19	2.42	2.63	29.4	04:39
average of 41. to 50. results	21.3	8.2	51.4	45.9	3.80	18.1	2.34	2.57	2.78	30.6	04:49
average of 51. to 60. results	20.2	7.8	48.7	42.9	3.91	19.6	2.49	2.71	3.01	31.4	05:01
average of results from 61.	16.3	6.8	40.2	29.2	4.15	21.8	2.76	3.10	3.49	33.8	05:33
total average from 1. to 76.	23.8	8.7	53.4	46.2	3.70	17.1	2.29	2.51	2.75	29.8	04:34



**Summary: TTC Wheelchair Tennis Fitness Test - Woman**

	ball toss	MB toss	grip right	grip left	dash	T-turns	r-r 1	r-r 2	r-r 3	5-point	1 km
		1 kg					5 kg	7.5 kg	10 kg		
	m	m	kp	kp	sec	sec	sec	sec	sec	sec	min
best result	17.2	9.7	41.2	37.8	3.89	15.1	2.22	2.25	2.31	29.3	04:44
average of all 17 results	13.3	7.7	32.9	30.9	4.25	16.9	2.56	2.64	2.80	31.9	05:17



## Analysis of tennis strokes in wheelchair tennis

Tjaša & Ales Filipčič (SLO)



*Ales Filipčič is a professor at the Faculty of Sport in Ljubljana (Slovenia). After he finished his competitive career he started to work as a coach in several tennis clubs in Slovenia. He was Davis Cup and junior captain in the years 1992 to 1995. In 1994 his team promoted to Euro-African group 1. In 1996 he became second president of Coaches association in Slovenia and in 1998 president of technical committee. From 1990 he organized several seminars for coaches, sport teachers and other participants at the Faculty of Sport. In addition, he published 6 books, 2 videocassettes and several scientific articles.*



*Tjaša Filipčič is an assistant at the Faculty of Education in Ljubljana (Slovenia). She finished Faculty of Sport and EMPDAPA study in Leuven (Belgium). In 1996 she started to work in different areas of adapted sport, such as recreation, elite sport and also research work. She is a promoter of wheelchair tennis and also a first coach of this sport in Slovenia. She has published one book and several scientific articles.*

### Introduction

Match analysis is an area of sport science that has matured over recent decades and has taken advantage of technological advances. It is also a term used to describe the analysis of actual sport competition. Two different approaches can be observed: firstly, practical match analysis exercises that are used within the media and coaching contexts to evaluate individual matches. This type of match analysis activity is characterised by the need to produce rapid performance information. Secondly, theoretical match analysis as a research discipline within sport that can discover general properties of competitive sport rather than merely retrospectively analysing unique characteristics of matches for historical purposes. Theoretical match analysis research is important for all five purposes of notational analysis such as: technical/tactical evaluation, analysis of movement, performance modelling and effectiveness of coach and player education (O'Donoghue, 2004). Several studies of match analyses in different sports of able bodied sports were published but on the other hand this can not be stated for adapted sport and in particular wheelchair tennis. Bullock & Pluim (2003) published some data from the match analyses where 150 rallies were analysed. Therefore, the purpose of the present research was to investigate patterns of play between wheelchair tennis players where larger number of rallies were analysed. In addition, the comparison between two levels of players (elite and recreational tennis players) was taken upon.

## Methods

### Subjects

The sample of subjects consisted of 15 male tennis players (top 100 – elite level, while 10 players represented the recreational level). All the players were in regular training (at least two training sessions/week). 14 players had acquired and complete SCI (Th 5- Th 12), while one player had congenital physical impairment. All players were wheelchair users and played at least 3 matches (best of two sets). The general characteristics of the players are presented in Table 1.

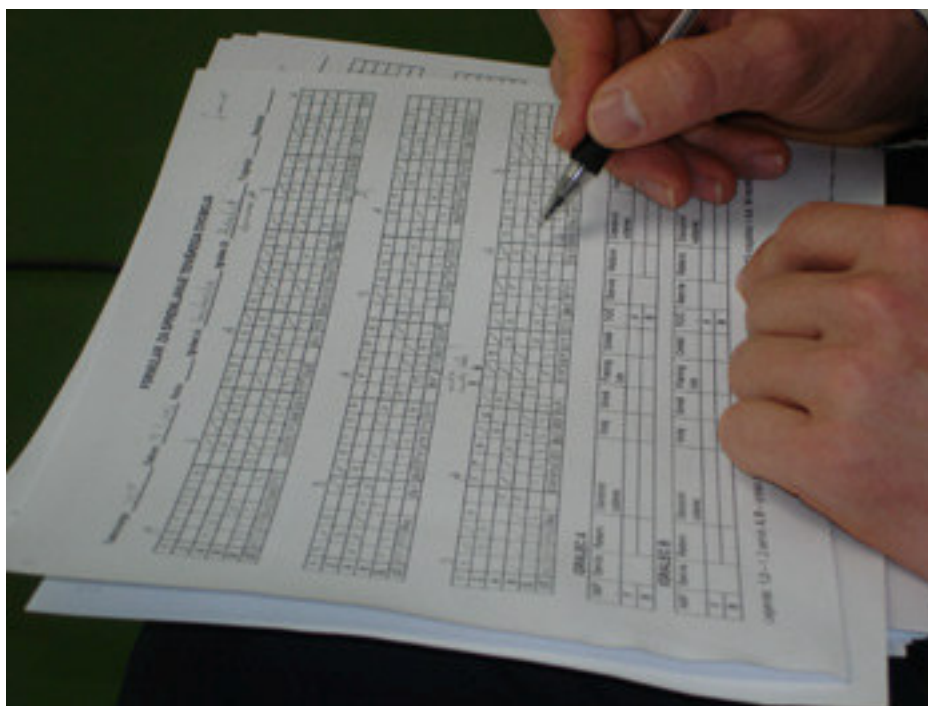
**Table 1: General characteristics of the subject sample**

	Minimum	Maximum	Mean	Std. Deviation
Age /years	27	53	39.06	8.24
Years in tennis training process	3	14	9	4.09
Tournament played per year	5	20	10	6.11
Training session/week	2	4	2.53	0.639

### Procedures

Data were collected in March 2006 in Tennis hall Triglav Kranj (Slovenia) where all matches were played on hard courts in constant conditions for all players. Two tournaments were organised. Firstly, a tournament was organised for recreational and secondly for elite players. The sample of variables included number of rallies, number of errors, winners, number of a particular stroke (backhand (B), forehand (F), return (R), smash (SM), volley (V), lob (L), drop shot (DS) and serve (S). A hand-notation system was used during all 22 matches (photo1) to collect the data which were analysed post-event.

Photo 1: A hand-notation system



## Results and discussion

In 22 tennis matches 2411 rallies were analysed. In Table 2 it is seen the mean number of shots/rally and elite and recreational level is very low (2.83). If we compare this to Bullock & Pluim (2003) who analysed average number of balls played per rally (4.67) in three matches from the 2000 Paralympic Games in Sydney, it is seen the number is lower. This may be due to fast surface. As far as mean number of shots/rally is concerned no significant difference was found between elite and recreational groups which was a surprise for us.

**Table 2: A comparison of match data (n=22) of elite and recreational male wheelchair tennis players**

	All matches together	Elite level	Recreational level
Number of tennis matches	22	11	11
Number of sets analysed	45	22	23
Number of rallies analysed	2411	1168	1243
Mean no. shots/rally	2.83	3.002	2.873

The sum of rallies analysed is 2411, (1168 in elite and 1243 in recreational level). The average number of shots/rally is 2.83. It is seen in Table 2 that players in the elite group performed more shots/rally (3.002) as compared to players in the recreational group (2.873). In the following text all data refers to all matches together. We compared the percentage (%) of particular last stroke in the rally. In addition, we will present some of the final strokes where differences among groups are evident and interesting.

**Table 3: % of winner strokes**

Type of stroke	All shots	Elite level	Recreational level
% serve - ace	4.396516%	3.5102743%	5.329284%
% Forehand	13.31398%	14.64041%	12.16758%
% Forehand return	6.719204%	4.880137%	8.547305%
% Forehand volley	0.663625%	0.856164%	0.582703%
% forehand smash	0.12443%	0.171233%	0.180451%
% forehand drop shot	0.580672%	0.599315%	0.563154%
% forehand lob	0.207383%	0.428082%	0%
% Backhand	7.382829%	8.083562%	6.777393%
% Backhand return	5.723766%	7.605479%	3.861625%
% Backhand volley	0.373289%	0.513699%	0.341352%
% Backhand drop shot	0.705102%	0.499315%	0.904505%
% Backhand lob	0.165906%	0.171233%	0.260901%
% Backhand passing	0.456242%	0.242466%	0.663154%
Sum %	40.81%	42.20%	40.18 %



It is seen (Table 2) that the forehand, forehand return, backhand and backhand return contribute the highest percentage of all winners in both groups. Other shots such as: volley, drop shot, lob and smash contribute low percentage of all shots in both groups. Also the serve is an important stroke. The forehand side is the stronger one in both groups. As far as differences among the groups are concerned players in the recreational group performed more forehand return winners. This is probably due to the slow serve of the players in this group which caused relatively efficient forehand return of the opponent. On the other hand, elite players have better serves that does not allow the opponent to perform a winner with the return. Elite players performed a significantly higher percentage of backhand return winners ( $p=.000$ ) as compared

to the recreational level as a result of good mobility after the serve. In addition, we observed that the recreational players performed a high percentage of backhand return errors (16%) that can be seen in table 3. Players in the elite group performed fewer winners with the serve as compared to recreational level. The cause is obviously the quality of the return and optimal movement after the stroke.

Forehand winners were performed in a higher percentage among the elite players compared to the recreational level. Elite players look for the opportunity to perform the forehand and finish the point. At forehand stroke players have more technical variability especially in different heights and rotation.

Backhand as a winner is performed in higher percentage among elite players as a result of the higher technical quality of the strokes. Recreational level players still have a lot of problems with the backhand.

**Table 3: % of errors**

Type of stroke	All shots	Elite level	Recreational level
% serve- double faults	7.922024%	7.876712%	7.964602%
% Forehand	13.35545%	13.18493%	13.51569%
% Forehand return	10.07881%	7.020548%	12.95253%
% Forehand volley	1.119867%	1.369863%	0.884956%
% forehand smash	0.290336%	0.499315%	0%
% forehand passing	0.207383%	0.085616%	0.321802%
% forehand drop shot	0.082953%	0.085616%	0.080451%
% forehand lob	0.082953%	0.171233%	0%
% Backhand	10.99129%	10.01712%	11.90668%
% Backhand return	13.72874%	16.08151%	11.47397%
% Backhand volley	0.955102%	1.027397%	0.402253%
% Backhand drop shot	0.12443%	0.085616%	0.160901%
% Backhand lob	0.041477%	0.085616%	0
% Backhand passing	0.207383%	0.206849%	0.160901%
Sum %	59.19%	57.80%	59.82%

The forehand, forehand return, backhand and backhand return and double faults also contribute the highest percentage of all errors in both groups. Other shots such as: volley, drop shot, lob, smash contribute low percentage of all shots in both groups (Table 3). Players performed more forehand errors and less forehand return errors as compared to backhand side. As far as the differences among the groups are



concerned no significant difference were found in forehand errors, while a significant difference in the forehand return ( $p=.002$ ) was observed. Namely, players in the recreational group performed more forehand errors. On the other hand, players in the elite group performed surprisingly more errors with the backhand return that is probably due to the fast and efficient serve of the opponent. When we observed the side of the 1<sup>st</sup> and 2<sup>nd</sup> serve it is seen that players in the elite group served mostly to the backhand side of the opponent.

### Conclusion

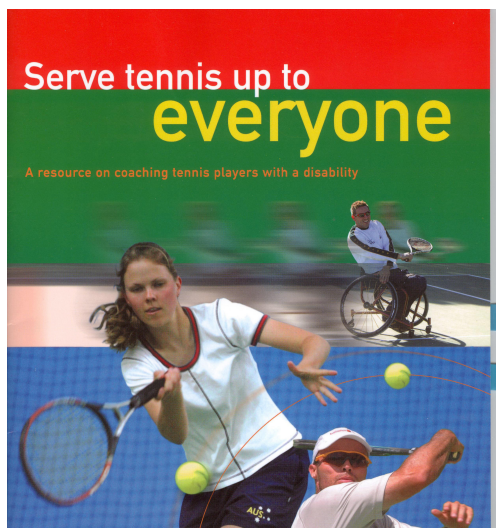
On a base of 2411 rallies it is seen that the forehand, forehand return, backhand and backhand return contribute the highest percentage of winners and errors in both groups. Players also performed more errors as compared to winners (59, 19 % vs. 40, and 81 %). As far as differences among groups are concerned few significant differences were found in the percentage of winners and errors. Therefore, additional research is needed in this field particularly in the area of the work rate of players, such as average speed, highest speed and positioning at the moment of hitting that will be presented in the future.

### Reference

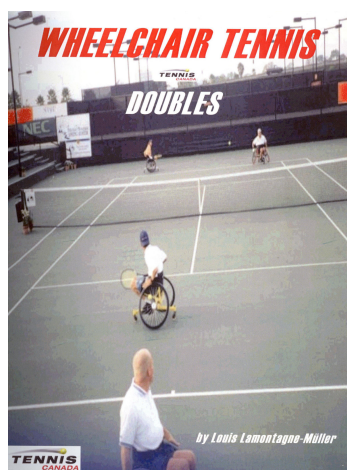
1. Bullock, M. & Pluim, B. (2003). *Wheelchair Tennis and Physical Conditioning*. ITF Wheelchair Tennis Coaches Review (9).
2. O'Donoghue, P. (2004). *Match Analysis in Racket Sports*. In A. Lees, Kahn, J.F & Maynard, I. (ur.), *Science and Racket Sports III*, Routledge, p.155-163.

## New Resources

### Serve Tennis Up to Everyone (Tennis Australia)



Tennis Australia have updated their resources on coaching tennis players with a disability. This excellent resource is a must read for any coach involved in tennis for people with a disability and it includes a section specifically on wheelchair tennis. It comes in either book or cd form and is AUD16.50 (not including postage).



### Wheelchair Tennis Doubles (Tennis Canada)

Louis Lamontagne-Müller has written the first ever manual on wheelchair tennis doubles. It is intended to assist athletes and players in developing their doubles knowledge and skills. The manual is available for for CDN\$23 plus tax. To place an order please email Janet Petras at [petras62@aol.com](mailto:petras62@aol.com).

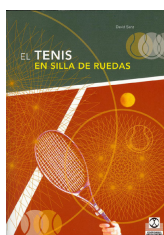
## ITF Coaching Weblet

For information relating to coaching please visit:

<http://www.itftennis.com/coaching/>

There are several interactive e-learning presentations on this weblet including one on physical conditioning in wheelchair tennis in English and a presentation in Spanish by David Sanz.

## Other Resources



### Spanish Coaching Manual

David Sanz (ESP) has written a comprehensive book on wheelchair tennis in Spanish. It includes all the information a coach requires. There is section on introductory skills and games appropriate for schoolteachers and physical therapists delivering wheelchair tennis in an educational or rehabilitation environment.

### French Coaching Manual



Pierre Fusade has written a wheelchair tennis coaches manual in French. This excellent publication will prove a valuable resource in French-speaking countries and is definitely worth a read.

To order copies of this publication please contact Pierre Fusade on: [Fusadepm@aol.com](mailto:Fusadepm@aol.com)

For a list of wheelchair tennis publications please refer to the first four editions of the *ITF Wheelchair Tennis Coaches Review*. They are available on the ITF website: [www.itftennis.com/wheelchair](http://www.itftennis.com/wheelchair).

### More information

If you would like information on organising wheelchair tennis programmes or coaching wheelchair tennis do not hesitate to call the ITF Wheelchair Tennis Department on ++44 (0) 20 8392 4788.

If you know of other coaches who would like to receive wheelchair tennis coaching information please ask them to send their name, address, email and an outline of their coaching experience to [mark.bullock@itftennis.com](mailto:mark.bullock@itftennis.com) or fax ++ 44 (0) 20 8392 4741.

For coaches wanting more information on the NEC Tour, world rankings, player profiles, head to head results please visit the ITF website: [www.itftennis.com/wheelchair](http://www.itftennis.com/wheelchair).

If you want to visit an NEC Tour event please refer to the website, [www.itftennis.com/wheelchair](http://www.itftennis.com/wheelchair) for the tournament schedule.

The articles in the ITF Wheelchair Tennis Coaches Review are written by a variety of contributors and the opinions expressed are not necessarily those of the ITF.