OPTIMIZING MEANINGFUL CONTACTS IN TENNIS PRACTICES

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Summary of Key Findings
Optimizing Meaningful Contacts in Tennis Practices

This mini-study encourages coaches, instructors, and teaching professionals to **optimize the number of meaningful, or random game-like, contacts in practices to better meet the needs of their athletes**. It defines a process for measuring the number and type of contacts and the time spent on different skills and activities in a tennis practice. It also provides data from four practices that demonstrate how the process is used. Coaches are encouraged to analyze their practices as a way of finding ways to better motivate more athletes to play tennis. For those not familiar with some of the terms used in this document, a definition of the terms is included at the end of this document.

Coaches are encouraged to use this or another process to track the activity in their practices.

The Process - Tracking Contacts

Identify information to track
Identify athlete to track
Description of activities
Time spent on activities
Number of contacts
Categorize activities
Calculate contacts and compare to standards
Improve future practices

This is a partial list of ways to increase the random number of contacts in practices.

Optimizing the Number of Random Contacts

Knowledgeable coaches
Practice mindset
  Environment where athletes learn from mistakes
  Incorporate enhanced discovered learning
  Research or evidence-based coaching
Organization of practices
  Improve unique skills of athlete
  Practice all skills and tactics
  Motivate and engage the athletes
  Practice activities should transfer to competition
  Incorporate sport-specific movement
  Succinct instruction and feedback
Court utilization
Social aspect of sports

Over the course of a season, the impact of poorly organized and executed practices add up quickly.

Cumulative Effects of Optimizing Meaningful Contacts
Over a Season with 20 Two-Hour Practices

Activity/Practice	Random Contacts Per Minute	Random Contacts Per Hour	Random Contacts Per Season
Maximum	5.0	300	12,000
Private Industry	4.4	265	10,560
Minimum	3.8	228	9,120
High School #2	1.5	90	3,600
High School #1	1.2	72	2,880
High School #3	1.1	66	2,640

The number of contacts in a practice will vary greatly based on the activities emphasized in practice.

Estimated Contacts Per Minute/Hour by Skill/Activity

Type of Contact/Activity	Contacts per Minute	Contacts per Hour
Kerber vs. Kvitova point (game-like)	21.8	1,309
Simon vs. Monfils point (game-like)	16.2	972
Groundstroke rally (random)	11.4	684
Net play (random)	9.8	588
Serves (blocked)	4.8	288
All-skills (random)	4.2	252
Match-play per Johnson's research	3.8	228
Serve returns (random)	2.8	168

INTRODUCTION

Over the years, I participated in and watched thousands of hours of practices in various sports; attended numerous coaching, education, sports, and business conferences; and talked with and listened to parents, coaches, and athletes. Through all of these experiences, I learned many lessons and became a better coach. Some of those lessons include:

- Most sports organizations need to do a better job educating people how to coach their sport.
- Coaching is much more than owning a drill book.
- Coaching is both a science and an art.
- Every day and every season is different. There is no such thing as a perfect drill or a "perfect practice".
- No matter how much a coach knows, there is always more than can be learned. There is a saying, "When one teaches, two learn."
- It is always possible to be a better coach and make today's practice even better than the practice yesterday.

Several years ago, I stopped by the public tennis courts to watch our daughters participate in a city-recreation tennis practice. I noticed the coach, a high school student, was giving his undivided attention to the one player who was ready to hit the ball. There was one player on deck and the other six players were trying to figure out a way to make the clock tick faster so they could escape the 90+-degree heat. The coach had the best of intentions, but he was not teaching tennis, he was teaching the kids to stand in line.

At first, I was upset the coach was not doing a better job, then I realized he was coaching the same way I coached when I was his age. The training for my first coaching job lasted two hours. We talked about the program rules we have to enforce, the registration process, how to fill out our time sheets, and complete an accident report if somebody got hurt. In the few minutes that were left, we quickly covered the techniques we were expected to teach. Our supervisor ended the discussion by saying, you are good tennis players, just teach it. Fortunately, we were not arrested for impersonating a tennis coach that summer.

My thoughts about my initiation into coaching were interrupted by the appearance of our daughters in the spotlight. The coach fed the first one a ball that she whiffed. The second one smacked the ball into the back fence. The coach politely said, "Nice try girls". They walked to the end of the line to continue their discussion.

I began taking notes and calculated that the group of ten-year olds hit the ball 33 times during their 45-minute practice session. Distressing! They spent the better part of 45 minutes talking with their friends and practicing their "standing-in-line" skills. When they got in the car I asked them what they learned. They said, "Suzie has a brown puppy named Jolly and Fred is really goofy". After additional questioning, there was good news. They were hot and bored to tears, but they wanted to attend the next practice.

It was déjà vu when our daughters started playing organized volleyball and participating in more advanced tennis programs. Our daughters learned the most when they had first-rate coaches and when they played in competition. First-rate coaches are important because most junior athletes spend more time in practice than in competition. By definition, competition is important because the contacts are meaningful and game-like. Whether it is practice or competition, the game teaches the game.

Meaningful practice matters!

CONTENTS OF MINI-STUDY

Numerous research studies have demonstrated that athletes experience greater long-term retention when coaches use random learning activities in their practices. It is necessary to blend non-tennis, blocked learning, and random learning activities in practice. Coaches should optimize the number of learning contacts and activities to meet the needs of the athletes.

PURPOSE, PROCESS, AND IMPLEMENTATION OF THE PROCESS

PURPOSE, THE PROCESS, IMPLEMENTATION OF THE PROCESS
Purpose of Mini-Study
The purpose of this mini-study is to encourage coaches, instructors, and teaching professionals to **optimize the number of meaningful contacts in their practices as a way of better meeting the needs of their athletes**. In turn, this will motivate more athletes to play tennis. This mini-study provides coaches, instructors, and professionals with:

- A underlined process for measuring the time spent and the number and type of contacts and activities in their practices. The focus is on non-tennis, blocked, and random activities. Coaches are encouraged to use this process or a variation of it to evaluate and improve their practices.
- Data from four practices sessions show what skills and activities other coaches have used, successfully and unsuccessfully, in their practices.
- An analysis of the data and observations that evaluate the effectiveness of the four practices. Coaches can use this analysis or an analysis of their own practices as a tool for optimizing the number of meaningful, or random game-like, contacts in their future practices.
- An analysis of contacts by skill to show how the number of contacts in a practice can vary based on the types of skills emphasized in a practice.

Meaningful contacts matter!

The Process
The process for this mini-study began by identifying an athlete whose activity was tracked through each of the four practice sessions. The assumption was that the number of her contacts would be representative of the larger group. In the high school practices her contacts were based on her activity as a singles player. In Colorado, tennis players are required to play either singles or doubles. As a result, the coach had them practice singles and doubles during most of the practice rather than focus on "playing tennis". The following information was collected:

- The number of participants in the drill.
- The number of courts used in the drill.
- The number of practice balls and carts.
- The starting and ending time for the practice and each activity. The number of minutes were rounded to the nearest minute.
- A brief name or description of the activity, for example, "Skyball".
- The contacts were counted for the identified player. This included all shots, including serves that were hit to initiate a drill. A contact

was not counted when a player missed because of a forced error or winner hit by her practice partner.
- After the practice, the activities were classified into three mutually exclusive categories: non-tennis, blocked, or random. General skills areas were also identified based on categories identified later in the document.
- The time spent and the number of contacts was recorded in a spreadsheet for each activity. Totals were calculated.

The collection of this information can be completed by a parent, athlete, or coach using a stopwatch and a notepad. It is helpful for the person who is tracking the activity to have some knowledge of tennis. The counting process is easier if a copy of the practice plan is available.

Variations for Data Collection
There are many ways to vary the data gathering process. In a world of unlimited time and resources, the practice could be videotaped and a more in depth and precise analysis could be prepared. The following are examples of the types of activities that could be counted:

- The number of specific shots hit, for example topspin vs. slice or down the line versus cross-court shots.
- The number, type of shots, and position on the court where a player missed a shot.
- The placement of the shot (where it landed on the court).
- The speed of the shot (this would require a radar gun to be used during the practice.)
- The number of shots where the athlete was in proper position.
- Safety factors, such as using a large number of balls.
- The amount of one-on-one coaching where coaches use cues.

The additional precision could provide coaches with information that would allow them to structure future practices that would better meet the needs of their athletes. Unfortunately, most coaches and professionals cannot justify the time and expense for this added precision.

Implementation of the Process for Collecting Data

During February and March 2017, four practice sessions were charted using the process outlined in the prior section. By design, the names of the programs are not identified. The intent is to focus on the process, not the merits of specific programs.

Each of the practices targeted high school players, who for the most part played at similar levels. The analysis shows that most practices have bright spots. As well, most practices can be improved. There is no perfect practice.

The first evaluation was a drill session at an indoor private facility. The other three evaluations were three practices for one high school program. At least a dozen uncharted practices were observed at both the private facility and the high school. The format, content, and number of random contacts for the uncharted drill sessions were similar to the data tracked in this analysis.

Practice at Indoor Facility - Fifteen athletes, both boys and girls, attended the session at the private facility. The same drills were done on each of the three courts and the athletes switched between courts frequently and quickly. In many cases, the athletes ran to the next activity when they switched courts.

In some drills, it was necessary for the players to sit out or stand in line briefly. In these situations, they were able to talk with coaches or other players. This helped build rapport with the coaches and allowed the athletes to ask questions in a one-on-one setting.

The coaches had names for the drills. When athletes did not understand the drill, other players or the coaches helped explain the drills in a one-on-one discussion. In most cases, the players initiated the drills.

High School Practices - In the high school practices, the team (11 to 13 players) had access to four to six courts. In most practices, the team typically spent the first 20 to 30 minutes on one court and the last 15 to 20 minutes on one court. Overall, it was common for the coaches to have all players practicing on only one court 30% to 40% of the entire practice.

The remainder of the time, the singles players practiced together and the doubles players practiced together. When the singles and doubles players were separated, it is estimated the doubles players practiced on one court about 20% of the time and two courts about 80% of the time. The doubles players were not charted, but it is likely they had fewer contacts than the singles players based on their drills and the number of players on the courts.

The singles players practiced on one court about 60% of the time and 40% of the time they worked on two courts. About half of the drills were initiated by the coaches, rather than by the players. On some occasions, the coaches and players from the boys' team participated in the drills.

Other similarities and differences between the two programs can be found in the following tables and comments.
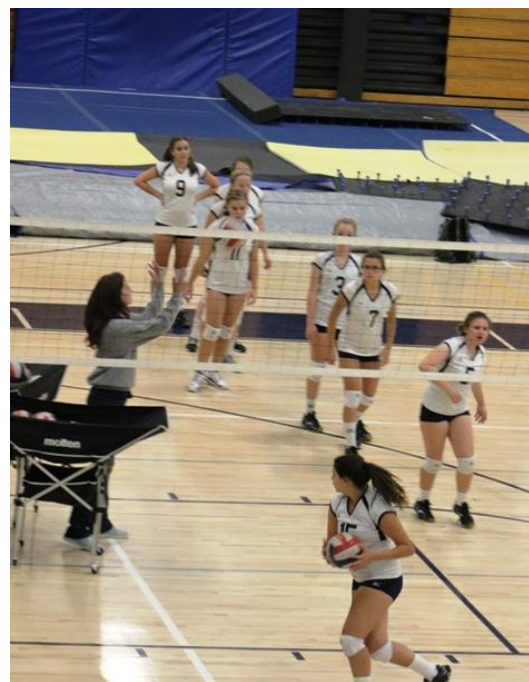
Blocked learning activities have value, on a limited basis, for teaching new skills and refining old ones. Coaches in many sports use them because they appear to be organized, whereas many random activities appear to be chaotic. Research shows that athletes have greater long-term retention when random learning activities are used in practice. In this picture, the coach is teaching players to hit a volleyball by tossing them a "perfect set". The coach is not teaching players to adapt to bad sets and they are likely to struggle in matches. Too often, blocked learning is overused in teaching tennis and other sports.

THE ANALYSIS OF FOUR PRACTICE SESSIONS
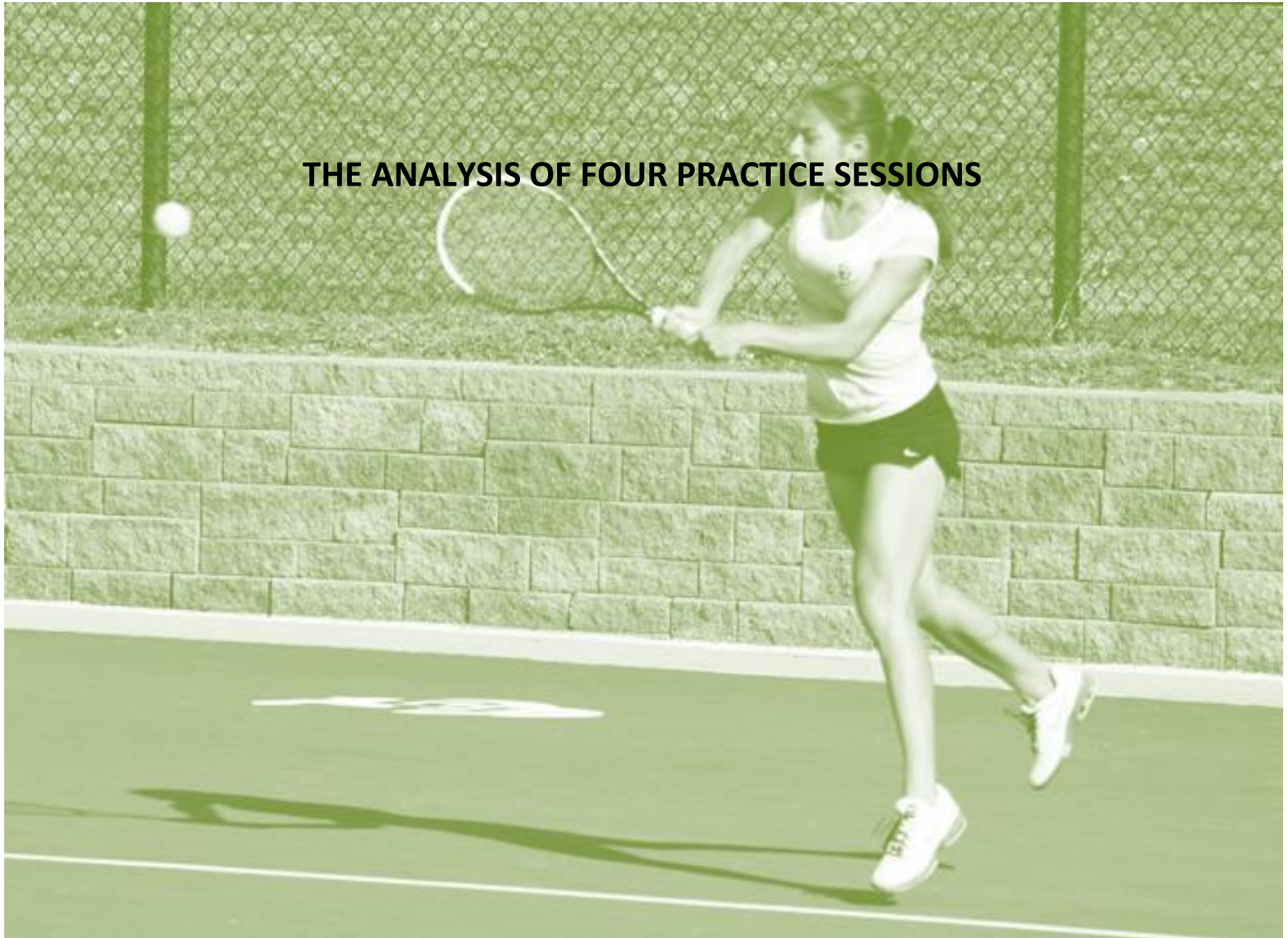
THE ANALYSIS OF FOUR PRACTICE SESSIONS
This section has been laid out to accommodate readers who have arithmophobia and only want to read the highlights. It also provides detail so those who like numbers can "look under the hood" for greater insight.

There are three sections:
- Summary of contacts and time spent per general skill.
- Comments and data for four practice sessions.
- Additional observations about the practice sessions.

The key terms in the <u>Summary of Contacts and Time Spent per General Skill</u> section are listed in the following box.

Summary of Contacts and Time Spent per General Skill
The sum of groundstrokes, net shots, serves, serve returns, and all skills activities equals the total contacts for the practice. Tactics are not included in this total.
- *Groundstrokes* - This skill includes forehands and backhands from the baseline, short court shots, approach shots, drop shots, and lobs. Drop shots, lobs, and short angle shots were not worked on and typically used in the all-skills and tactical activities.
- *Net* - This skill includes volleys, swinging volleys, overheads, and chasing down overheads. These shots were typically worked on in the all skills or tactical activities.
- *Serves* - Athletes typically spent six to ten minutes warming up and hitting their serves as blocked practice. Serving was typically worked on in the all - skills activities.
- *Serve return* - The serve return was not emphasized. Returns were usually hit as a part of all skills activities.
- *All Skills* - Any shot that would be hit in a match.
- *Tactics* - Activities that were game-like or that involved strategy or scoring.

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he key terms in the <u>Comments and Data</u> section for the four practices are listed in the following box. Coaches can read the comment section and peruse the tables to gain additional insight about the practices.

Summary of Comments and Data Per Practice
The data on the summary of the practice sheets includes the following columns.
- *Action/number* - Identifier number.
- *Start time of the activity* - The time the activity started.
- *Minutes* - The number of minutes spent on the activity.
- *Activity* - This is the name or brief description of the activity.
- *Skills emphasized* - Blocked and random activities were categorized into groundstrokes, net, serve, serve returns. all-skills, and tactics.
- Non-tennis activities - The time spent is recorded for non-tennis activities.
- Blocked activities- The number of contacts and time spent are recorded for blocked activities.
- Random activities - The number of contacts and time spent are recorded for random activities.
At the bottom of each table, totals and percentages are calculated

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The final section includes a single table - <u>Additional Observations about the Practices</u>. A variety of different topics are briefly addressed or re-emphasized in this section.

THE ANALYSIS - SUMMARY OF CONTACTS AND TIME SPENT PER GENERAL SKILL

The following two tables summarize the general skills in the four practices. The first table provides a summary of the total number of contacts (random and blocked) and the total number of random contacts per hour for each skill.

Number of Contacts per Skill

Practice	Groundstrokes	Net	Serve	Serve Return	All Skills	Tactics	Total Contacts in Practice	Total Random Contacts per Hour
Indoor Facility	227	39	38	0	132	206	436	265
High School #1	148	51	36	0	0	0	235	74
High School #2	66	34	22	0	106	106	228	90
High School #3	23	19	16	11	82	124	151	68

The second table provides a summary of the time spent, in minutes, on each skill. In addition, it has the contacts per minute for each general skill. The practice session at the indoor facility usually had a higher rate of contacts per minute for most general skills. Notice how the contact rate per minute is higher from groundstrokes and net play and lower for serves and all skill activities.

Number of Minutes per Skill and Contacts per Minute for Each Skill

Practice	Groundstrokes	Net	Serve	Serve Return	All Skills	Tactics	Non-Tennis Activities	Total Minutes in Practice
Indoor Facility Minutes	20	4	8	0	38	48	20	90
Contacts/Minute	*11.4*	*9.8*	*4.8*	*-*	*3.5*	*4.3*		
High School #1 Minutes	30	23	10	0	0	0	57	120
Contacts/Minute	*4.9*	*2.2*	*3.6*	*-*	*-*	*-*		
High School #2 Minutes	24	15	6	0	25	25	50	120
Contacts/Minute	*2.8*	*2.3*	*3.7*	*-*	*4.2*	*4.2*		
High School #3 Minutes	10	6	8	4	48	64	44	120
Contacts/Minute	*2.3*	*3.2*	*2.0*	*2.8*	*1.7*	*1.9*		

These summary tables emphasize the following points
- All practices are different for a variety of reasons.
- The different skills have significantly different contacts per minute. Coaches can create practices that are more effective by managing this difference.
- There was an emphasis on all skills and tactics in three of the four practices.

> **Coaches should optimize the number of random game-like contacts in their practices to meet the needs of their athletes.**

- There is value in non-tennis activities; however, these activities took up 37% to 48% of the time in high school practices. As a result, their practices only had 68 to 90 random contacts per hour. On the other hand, the coaches at the indoor facility averaged 265 random contacts per hour.
- The coaches could create greater variability in practices by periodically working directly on shots such as lobs, drop shots, and swinging volleys.

THE ANALYSIS - COMMENTS AND DATA - PRACTICE #1

Comments: The 90-minute drill sessions were upbeat, fast-paced, and flowed smoothly. The coaches spend little time in discussions, picking up balls, and drinking water. This session had three concentrations of random activity. First, the athletes warmed up and hit all shots except their serve. There were 192 random contacts made during the 14 minutes of warm ups (5:05 to 5:19). On average, there were 13.7 contacts per minute. Most of these contacts were random, but not game-like; however, they allowed the athletes to get warmed up quickly. Second, they played half-court groundstroke points. There were 74 random contacts made during the 17 minutes of groundstroke drills (5:19 to 5:36), or 4.4 contacts per minute.

> 265 random contacts per hour
> 4.4 contacts per minute - 90 minutes
> 48 minutes - activities with tactics
> 38 minutes -activities with all-skills
> 20 minutes - non-tennis activity

Third, they hit serves then played points in various situations. They did not directly practice serve returns, but this concentration of activities included serve returns. There were 132 random contacts during the 39 minutes of game-like point situations (5:49 to 6:28), or 3.4 contacts per minute. The group spent 20 minutes in non-tennis activities, in part because the session started three minutes late. In addition, the player being tracked set out three times during the groundstroke point drills. The variation in the number of contacts for each of these concentrations illustrates how the contacts-per-minute can vary greatly. This illustrates why random contacts should be optimized rather than maximized.

Practice #1 - Private Indoor Facility

Action Number	Start Time	Minutes	Action Description	Skills Emphasized	Non-Tennis Activity Contacts	Non-Tennis Activity Minutes	Blocked Activity Contacts	Blocked Activity Minutes	Random Activity Contacts	Random Activity Minutes
1	5:00	5	Start - Discussion - (started 3 minutes late)		0	5				
2	5:05	2	Short court rally	Groundstrokes					73	2
3	5:07	5	Groundstrokes - baseline	Groundstrokes					47	5
4	5:12	3	1 back 1 volley/overhead	Groundstrokes					33	3
5	5:15	4	Reverse positions - 1 volley 1 back	Net					39	4
6	5:19	3	Half court points - groundstrokes	Groundstrokes, tactics	0	3				
7	5:22	3	Half court points - groundstrokes	Groundstrokes, tactics					26	3
8	5:25	2	Half court points - groundstrokes	Groundstrokes, tactics	0	2				
9	5:27	2	Half court points - groundstrokes	Groundstrokes, tactics					16	2
10	5:29	2	Half court points - groundstrokes	Groundstrokes, tactics					13	2
11	5:31	3	Half court points - groundstrokes	Groundstrokes, tactics					19	3
12	5:34	2	Half court points - groundstrokes	Groundstrokes, tactics	0	2				
13	5:36	8	Serving - no return	Serving			38	8		
14	5:44	5	Pick up Balls/water break		0	5				
15	5:49	10	Two on one - singles approach the net	All skills, tactics					55	10
16	5:59	12	One on two - approach on short ball	All skills, tactics					29	12
17	6:11	1	Water break		0	1				
18	6:12	16	Serve and singles points	All skills, tactics					48	16
19	6:28	2	Pick up balls-end at 6:30		0	2				
20	Total	90	Totals		0	20	38	8	398	62

Total random contacts per total time (398/90) - 4.4 contacts per minute or one contact every 13.6 seconds or 265 contacts per hour.

Total contacts per total time (436/90) - 4.8 contacts per minute or one contact every 12.4 seconds or 291 contacts per hour.

THE ANALYSIS - COMMENTS AND DATA - PRACTICE #2

Comments: The practice was the day before a match. The coaches lack an understanding of the importance of random contacts. During the first 39 minutes (3:20 to 3:59), there were NO random contacts. For ten minutes (Line 4) during this period, the team stood in a line and hit serves. When a player missed a serve, the entire team ran wind sprints. There were very few balls hit and the ones that were hit did not reflect the ways the girls served in match play. It is questionable why the coaches would emphasize negative reinforcement the day before competition. This and other team rules created a punitive learning environment. Between 4:03 and 4:27, there were 105 random contacts, or 4.4 contacts per minute for the attack and defend drill. The coaches believe the players should play aggressively so they emphasize the attack and defend drill. The drill has merit, but it should be used in conjunction with other drills that help the players improve their weaknesses and turn their strengths into dominating strokes. Practice drills should be selected to meet the different needs of the players, because they have different goals, skills, ability levels, and styles of play. About 71% of the random contacts for the entire practice occurred within this 24-minute period. By comparison, the team spent 37 minutes in discussions, picking up balls, and having water breaks during the entire practice. It is doubtful if this practice prepared the athletes for the match the next day.

> **74 random contacts per hour**
> **1.2 random contacts per minute - 2 hours**
> **0 minutes - activities with tactics**
> **0 minutes - activities with all-skills**
> **47 minutes - non-tennis activity**

Practice #2 - High School Practice #1

Action Number	Start Time	Minutes	Action Description	Skills Emphasized	Non-Tennis Activity		Blocked Activity		Random Activity	
					Contacts	Minutes	Contacts	Minutes	Contacts	Minutes
1	3:20	10	Run, stretch, discussion		0	10				
2	3:30	10	Practice serves	Serves			36	10		
3	3:40	5	Pick up balls water break		0	5				
4	3:45	10	Serve one-at-time; sprints when they miss.		0	10				
5	3:55	4	Pick up balls, water break, discussion		0	4				
6	3:59	4	Split into two groups, players rally to warm up	Groundstrokes					24	4
7	4:03	4	Attack and defend drill	Groundstrokes, net, tactics					15	4
8	4:07	2	Water break		0	2				
9	4:09	4	Switch roles in A&D drill	Groundstrokes, net, tactics					24	4
10	4:13	4	Water break		0	4				
11	4:17	3	Switch roles in A&D drill	Groundstrokes, net, tactics					27	3
12	4:20	7	Switch roles in A&D drill	Groundstrokes, net, tactics					39	7
13	4:27	2	Water break, pick up balls, discussion		0	2				
14	4:29	16	Coach fed balls/variety of groundstroke shots	Groundstrokes, net			51	16		
15	4:45	7	Pick up balls, water break, discussion		0	7				
16	4:52	15	Team game on one court.	Groundstrokes, net					19	15
17	5:07	13	Pick up balls, discussion, practice ends at 5:20		0	13				
18	Total	120	Totals		0	57	87	26	148	37

Total random contacts per total time (148/120) - 1.2 contacts per minute or one hit every 48.6 seconds or 74 random contacts per hour.

Total contacts per total time (240/120) - 2.0 contacts per minute or one hit every 30 seconds, or 120 total contacts per hour.

THE ANALYSIS - COMMENTS AND DATA - PRACTICE #3

Comments: This practice occurred the day after a match. It had the highest number of random contacts, 179, for the three high school practices. There were 137 random contacts during the 58 minute period, from 3:51 to 4:49, or 2.4 contacts per minute. During this 58 minute period, the coaches spent 38 minutes in activities and 20 minutes in non-tennis activity. About 77% of the random contacts for the entire practice occurred during this 58-minute period. During this period the coaches spent 14 minutes doing the alternating singles drill on one court. This drill has value, but the coaches could have better utilized the courts and increased the number of contacts by having the athletes play singles on two courts instead of one. A review of the other 62 minutes of the practices shows there were only 42 random contacts during that time.

> 90 random contacts per hour
> 1.5 random contacts per minute-2 hours
> 25 minutes - activities with tactics
> 25 minutes - activities with all-skills
> 50 minutes - non-tennis activity

Practice #3 - High School Practice #2

Action Number	Start Time	Minutes	Action Description	Skills Emphasized	Non-Tennis Activity		Blocked		Random	
					Contacts	Minutes	Contacts	Minutes	Contacts	Minutes
1	3:20	15	Run, stretch, discussion		0	15				
2	3:35	4	Partner singles	All skills, tactics					26	4
3	3:39	2	Discussion		0	2				
4	3:41	3	Dead ball forehand feed	Groundstrokes			11	3		
5	3:44	4	Discussion/water break		0	4				
6	3:48	3	Dead ball backhand feed	Groundstrokes			16	3		
7	3:51	3	Pick up balls/discussion		9	3				
8	3:54	7	Variation on defend and attack - fed by coach	Groundstrokes, net, tactics					35	7
9	4:01	2	Water break and discussion		0	2				
10	4:03	10	Variation on defend and attack - fed by coach	Groundstrokes, net, tactics					22	10
11	4:13	6	Pick up balls, water break, discussion		0	6				
12	4:19	5	Alternating singles points	All skills, tactics					12	5
13	4:24	1	Water break, discussion		0	1				
14	4:25	4	Alternating singles points	All skills, tactics					17	4
15	4:29	2	Pick up balls, water break, discussion		0	2				
16	4:31	5	Alternating singles points	All skills, tactics					26	5
17	4:36	3	Water break, discussion		0	3				
18	4:39	7	Doubles from the baseline	Groundstrokes, net, tactics					25	7
19	4:46	3	Pick up balls, water break, discussion		0	3				
20	4:49	6	Practice serve, one court	Serve			22	6		
21	4:55	1	Discussion		0	1				
22	4:56	4	Wind sprints		0	4				
23	5:00	16	Sky ball	Groundstrokes, net					16	16
24	5:16	4	Pick up balls, discussion, ends 5:20		0	4				
25	Total	120	Totals		0	50	49	12	179	58

Total random contacts per total time (179/120) - 1.5 contacts per minute or one hit every 40.2 seconds, or 90 random contacts per hour.

Total contacts per total time (228/120) - 1.9 contacts per minute or one hit every 31.6 seconds, or 114 contacts per hour.

THE ANALYSIS - COMMENTS AND DATA - PRACTICE #4

Comments: This practice was not adjacent to a match (the day before or day after). This practice was unique because the singles and doubles players played together the entire practice, i.e. the singles players played doubles. This was an anomaly. This was the only practice where serve returns were practiced. This occurred for only four minutes while the other players were practicing serves. There were 135 random contacts during this entire practice, the lowest of the four practices. Between 3:46 and 5:11 (85 minutes), there were 68 minutes of random contacts, or 0.8 contacts per minute. Seventeen minutes were spent in non-tennis activities. There were 48 minutes of all skills activities and 64 minutes of activities that included tactics; however, the contacts per minute were 1.7 and 1.9 respectively. Coaches should limit the number and time of water breaks and discussions is to a maximum of one minute, the time allowed on changeovers during competition. Many coaches often close their practice with a fun activity such as Skyball or Around the World. The primary value of these drills is to bring the team together in an upbeat activity at the end of practice. These drills usually have limited value for the athletes.

> **68 random contacts per hour**
> **1.1 contacts per minute-2 hours**
> **64 minutes - activities with tactics**
> **48 minutes - activities with all-skills**
> **44 minutes - non-tennis activity**

Action Number	Start Time	Minutes	Action Description	Skills	Non-Tennis Activity Contacts	Minutes	Blocked Contacts	Minutes	Random Contacts	Minutes
1	3:20	12	Run, stretch, discussion		0	12				
2	3:32	1	Coaches ties up her escaped dog		0	1				
3	3:33	3	Discussion		0	3				
4	3:36	8	Serves	Serves			16	8		
5	3:44	2	Discussion/water break		0	2				
6	3:46	4	Serve returns	Serve returns					11	4
7	3:50	3	Pick up balls/discussion		0	3				
8	3:53	6	Play doubles-start with a groundstroke	Groundstrokes, net, tactics					11	6
9	3:59	1	Water break		0	1				
10	4:00	4	Same drill switch opponents	Groundstrokes, net, tactics					16	4
11	4:04	3	Water break/discussion		0	3				
12	4:07	6	Same drill switch opponents	Groundstrokes, net, tactics					15	6
13	4:13	1	Water break		0	1				
14	4:14	27	Play doubles-start w/serves	All skills, tactics					46	27
15	4:41	1	Water break		0	1				
16	4:42	10	Continue playing	All skills, tactics					16	10
17	4:52	8	Water break, pick up balls, discussion		0	8				
18	5:00	11	Team singles, whole team	All skills, tactics		0			20	11
19	5:11	3	Pick up balls/discussion		0	3				
20	5:14	4	Filler activity - no value		0	4				
21	5:18	2	Pick up balls/discussion		0	2				
22	Total	120	Totals		0	44	16	8	135	68

Practice #4 - High School Practice 3

Total random contacts per total time (135/120) - 1.1 contacts per minute or one hit every 53.3 seconds, or 68 random contacts per hour.

Total contacts per total time (154/120) - 1.3 contacts per minute or one hit every 46.8 seconds or 76 contacts per hour.

THE ANALYSIS -ADDITIONAL OBSERVATIONS ABOUT THE PRACTICE SESSIONS

This section provides additional observations and emphasizes key points about the four practices.

Private Facility Practices		High School Practices
The professionals are certified by industry trade associations and have international, national, and collegiate playing and coaching experience. They are engaged in the tennis community.	*Background of Coaches and Professionals*	Coaches passed the state athletic association coaching test. They are passionate about the sport and are mid-level recreation players and coaches. They have minimal engagement in the tennis community.
There was one short set of announcements or discussion at the start of the practice. Drills had names and subsequent discussions were 30 seconds or less. Instruction and feedback during the drills was provided in succinct individualized comments from the coaches. The program has three ball carts. A minimum of 1,000 balls were used for the practices. This reduced the time spent picking up balls. The staff makes an effort to keep the court clear of balls throughout the practice. They picked up balls twice and there were three water breaks during the 90-minute practice.	*Organization of Practice*	The practices were 120 minutes in length. During the practices, the team had six to seven water breaks, although the activity level, humidity, and temperatures did not warrant that many. The team has two hoppers of balls, about 125 to 150 total balls. During practices the singles players and doubles players, each had access to one hopper. As a result, players had to frequently pick up balls. They had between four and eleven discussions per practice and they picked up balls four to five times during and after practice.
There were three concentrations of random activity: (1) warm-up, (2) groundstroke points, and (3 singles/doubles points. As a result, the contacts per minute for the entire practice were greater.	*Concentrations of Activity*	Each practice typically had only one concentration of random activity. The concentrations for each of the three practices were attack and defend; attack and defend and alternating singles; and playing doubles.
Conditioning and stretching were not a part of the session. Players who felt they needed to stretch did so prior to the start of practice. The coaches kept the players moving during and between drills. Most likely, the athletes experienced more sports specific conditioning than if they had spent 15 minutes of conditioning at the start of the practice.	*Conditioning*	The team began most practices by running for about five minutes and stretching. It is questionable if this had any value. Practices would be more beneficial if the players had a higher level of enthusiasm, hustle, movement, and intensity during and between activities. Conditioning and injury prevention drills could be set up for athletes outside practice.
The athletes practiced all the skills they would use in a match. There was an emphasis on both the techniques (how) for hitting groundstrokes and the tactics (why) for using them in a match. About 42% of the practice time was spent in activities that emphasized all-skills and 53% was spent in activities that emphasized tactics. There were 3.5 contacts per minute in all-skills activities and 4.3 contacts per minute in activities that involved tactics. The coaches focused on teaching the players to play tennis, not just singles or doubles.	*Emphasis on All-Skills and Tactics*	The practices had a single focus and only covered a portion of the skills used in a match. A practice held the day before a match did not include activities that emphasized all-skills and tactics. On average, about 20% of the total practice time was spent in activities that emphasized all-skills and 25% was spent in activities that emphasized tactics. On average, there were 2.6 contacts per minute in all-skills activities and 2.6 contacts per minute in activities that involved tactics. The coaches focused on having the athletes play only singles or doubles.
During the entire practice, the players moved between courts and played with players of different abilities and genders.	*Mixing Players with Different Abilities*	Teams are required to have their top three players play singles. The singles players practiced by themselves at least 60% of the time. There is value in having players play both singles and doubles.
Blocked learning was used for serving practice. The players warmed up theirs serves for about ten minutes by hitting to both sides of the court. During this period, the coaches provided one-on-one assistance.	*Serving Practice*	The players served for about ten minutes to both sides of the court. The coaches often stayed on the sidelines and watched. In one activity, they made players run wind sprints when they missed their serves.
The coaches provided the athletes with succinct feedback and encouraged them to play outside their comfort zone, make mistakes, and learn from them.	*Motivation*	The coaches used punishment as a form of motivation in some of their on and off court activities.
The players initiated most drills. When there was an odd number of players, coaches sometimes participated in drills.	*Coach-Fed vs. Player Fed Drills*	The coaches fed about half the drills from the side of the court. About 40% of the time they or players from the boys' team participated in drills.

PUTTING THE NUMBER OF RANDOM GAME-LIKE CONTACTS
IN PERSPECTIVE/TERMS

PUTTING THE NUMBER OF RANDOM GAME-LIKE CONTACTS IN PERSPECTIVE

The Number of Random Game-Like Contacts in a Perfect Practice

What is the suggested minimum and maximum number of random game-like contacts that should occur in a "perfect" practice?

Minimum Number of Random Game-Like Contacts

A starting point is to assume that the number of random game-like contacts in a practice should be similar to the number of contacts in a competitive match, where all the contacts are random and game-like. In an article published in the British Journal of Sports Medicine (*Performance demands of professional male tennis players,* 2005) C.D. Johnson and M. P. McHugh identified the average number of contacts in a game.

Estimated Contacts During a Match

Stroke	# Contacts	6-0 Score	6-2 Score	6-4 Score	7-5 Score
Serving					
1st Serve	6.4	19.2	25.6	32	38.4
2nd Serve	2.5	7.5	10.0	12.5	15.0
Groundstrokes	8.4	25.2	33.6	42.0	50.4
OH/Volleys	0.9	2.7	3.6	4.5	5.4
Total Serving	18.2	54.6	72.8	91	109.2
Receiving					
Returns	5.3	15.9	21.2	26.5	31.8
Groundstrokes	6.8	20.4	27.2	34.0	40.8
OH/Volleys	0.2	0.6	0.8	1.0	1.2
Total Receiving	12.3	36.9	49.2	61.5	73.8
Total	30.5	91.5	122.0	152.5	183.0
Time to complete		24	32	40	48
Contacts/min.		3.8	3.8	3.8	3.8

Based on Johnson's research, it is estimated that 3.8 contacts are made per minute or 228 contacts per hour. Coaches should be ready to calibrate these numbers for their athletes because they will vary based on the gender, ability, age, and style of play. Since a practice is in a more controlled setting than a match, it is reasonable to establish 228 random game-like contacts per hour, or 3.8 contacts per minute, as a general guideline for a minimum number of random game-like contacts.

Maximum Number of Random Contacts

The maximum number of random contacts per hour will be arbitrarily set at 300 contacts per hour, or five contacts every minute. As will be shown in the following discussion, It is virtually impossible to exceed this level and run a mix of drills that include tactics and all skills that players will use in a match.

Consider the two tournament points that are available on You Tube.
- Gilles Simon won a 103-second rally when Gael Monfils missed on the 71st shot. Simon had 16.2 contacts per minute, the equivalent of 972 contacts per hour (2013 Australian Open).
- Angelique Kerber won a 55-second rally. Petra Kvitova missed on the 41st shot. Kerber had 21.8 random contacts per minute, the equivalent of 1,309 contacts per hour (2016 Wuhan Open).

Athletes must develop the skills to play long points; however, it can be seen in a video review of these two points that the athletes cannot play at that level on an extended basis. Besides, players typically have fewer than three contacts on most points.

The table below shows the estimated number of contacts per minute/hour based on the information compiled for this document.

Contacts Per Minute/Hour by Skill/Activity

Type of Contact/Activity	Contacts per Minute	Contacts per Hour
Kerber vs. Kvitova point (game-like)	21.8	1,309
Simon vs. Monfils point (game-like)	16.2	972
Groundstroke rally (random)	11.4	684
Net play (random	9.8	588
Serves (blocked)	4.8	288
All-skills (random)	4.2	252
Match-play per Johnson's research	3.8	228
Serve returns (random)	2.8	168

Any coach can use this table or one derived from their practices to find a way to blend non-tennis, blocked, and random learning activities that cover all skills and easily attain the minimum of 228 contacts per hour. Again, **the purpose of a practice is to optimize the number of meaningful contacts to meet the needs of the athletes.**

OPTIMIZING THE NUMBER OF MEANINGFUL, RANDOM GAME-LIKE, CONTACTS

Coaches can optimize the number of meaningful, random game-like, contacts in practices by considering the following ideas that were generated from watching the practices and evaluating the data used for this mini-study.

Top Program Priority
- Optimize the number meaningful, or game-like, contacts to meet the needs of the players.

Coaching Qualifications
- Experienced, certified professionals typically have the knowledge to run practices that better meet the needs of the athletes.
- Less experienced coaches should work with mentors.
- Coaches should be engaged in the tennis community.
- When high school players have private coaches, high-school coach should be in communications with those private coaches.

Practice Mindset
- Practices should be based on evidence-based coaching techniques.
- Create a growth mindset or an environment where athletes are encouraged to make mistakes and learn from them.
- Incorporate enhanced discovered learning.
- Punishment is usually not an effective means of motivation.

Organization of Practices
- Practices should be more than a series of activities from a drill book.
- Practices should address each player's unique skills and needs.
- Players should be motivated and engaged in practices.
- Practice activities should transfer to match play.
- Practice activities should be based on performance in competition.
- Practice all skills that will be used in a match.
- Provide succinct instructions and feedback in drills and match play.
- Play singles and doubles.
- Incorporate sport-specific movement in drills.
- Use a sufficient number of balls in practice - use them safely.
- Athletes should initiate as many drills as possible.
- Set up individual conditioning and injury prevention programs to be completed outside practice.

- Use 228 meaningful, or random game-like, contacts per hour as a minimum guideline for practices. Meet the needs of the players.

Court Utilization
- Court time is a precious commodity, use the courts efficiently.

Social Aspect of Sports
- Recognize the importance of camaraderie and fun, but maintain focus in practices.

Every practice and competition provides information that can be used to make the next practice better than the last practice.

USA Volleyball produced the following Coaching Manifesto word cloud. It applies to volleyball, tennis, and other sports.

CUMULATIVE EFFECT OF MEANINGFUL CONTACTS

The cumulative effect of optimizing meaningful or random game-like, contacts can be seen in the table below. It shows the number of meaningful contacts a player will have during a season that includes 20 practices. Based on the data provided earlier, the athletes in the private industry program will have 10,560 random contacts. By comparison, a program meeting the suggested minimum will have 9,120 random contacts. The high school programs will have significantly fewer meaningful contacts than the suggested minimum.

Cumulative Effect of Meaningful Contacts Over a Season with 20 Two-Hour Practices

	Random Contacts per Minute	Random Contacts Per Hour	Random Contacts per Practice (2 hours)	Random Contacts per Season (20 practices)
Arbitrary maximum	5.0	300	600	12,000
	4.8	288	576	11,520
	4.6	276	552	11,040
Private Industry	4.4	264	528	10,560
	4.2	252	504	10,080
	4.0	240	480	9,600
Suggested Minimum	3.8	228	456	9,120
	3.5	210	420	8,400
	3.0	180	360	7,200
	2.5	150	300	6,000
	2.0	120	240	4,800
High School #2	1.5	90	180	3,600
	1.4	84	168	3,360
	1.3	78	156	3,120
High School #1	1.2	72	148	2,880
High School #3	1.1	66	132	2,640
	1.0	60	120	2,400

CONCLUDING THOUGHTS

There are a handful of take-aways from this mini-study.

1. Coaches must blend non-tennis, blocked, and random game-like training activities into their practices. In the process, they should optimize the number of meaningful contacts in practice sessions as a way of better meeting the needs of the athletes.

2. Coaches can more effectively design practices by using measurements of the time spent and the number of random contacts their athletes make on key skills and activities. Each set of skills has a different number of contacts per minute based on the skills of the athletes in their programs.

3. Practice sessions must meet the needs of the athletes and transfer to competitive play. Research has shown the most efficient way to accomplish this is through random game-like practice activities.

4. This mini-study has identified 228 random contacts per hour, or 3.8 contacts per minute, as a minimum that coaches should strive for in their practices. Each coach should calibrate this minimum so it is appropriate for the athletes in their programs.

5. Most junior players spend more time practicing or playing practice matches than they spend in competition. In other words, the number of contacts per practice has a significant cumulative effect over the season.

Meaningful practice matters!

About the Author Gary Horvath is member of the United States Professional Tennis Association (USPTA). Out of 15,000 members, he is one of 150 professionals who is certified as a Master Professional. He has been recognized for coaching juniors and adults in programs ranging from entry level to college teams. In addition, he is the founder of the USA Professional Platform Tennis Association. In that capacity he helped develop the organizational structure, the certification criteria, and testing process for the sport's teaching professionals. The PPTA recently merged with the USPTA. Horvath is also a certified USA Volleyball CAP-I Instructor and has been an evaluator for their High Performance program. In addition, Horvath has written numerous articles for tennis and platform tennis publications. Horvath is a long-standing member of the Wilson Advisory Staff. Special thanks to Dave Romberg, USPTA, and Jan Valentine and John Nesslage for their extensive comments. Photo credits: Gary Horvath

DEFINITION OF TERMS

This section includes definitions of terms are used in this mini-study.

- *Blocked learning activities* - Blocked learning is most effectively used to teach one skill, new skills, or modifying existing skills. Blocked activities emphasize repetition rather than teaching the athlete to learn to adjust or solve problems. Blocked learning is popular because it is orderly and it makes the coach and athlete feel they have mastered a skill. Too often the used of blocked learning creates a false sense of achievement. Because the athlete has not been taught to adjust or solve problems there is minimal retention, it will likely not transfer to competition.

- *Enhanced discovered learning* - A coach provides the foundation for the skill to be learned and some guidance during the learning process. As a result of this "guided" approach, the athlete learns the skill.

- *Game-like activities* - Game-like activities resemble those found in competition. Many game-like activities include scoring and replicate the chaotic nature of competition. Coaches often start as many game-like drills as possible with serves and the drills are naturally terminated. Random learning is the backbone of game-like activities because the skills learned are more likely to be retained in competition. Game-like activities require athletes to adjust and solve problems. They are essential because most junior athletes spend more hours in practice situations than in competition.

- *Maximize random game-like activities and contacts* - The term maximize means to make as large as possible. It is not always in the best interest of the athletes to have the largest possible number of random game-like activities in a practice. It is usually more effective to optimize the number of random game-like contacts to meet their needs.

- *Meaningful practice* - Meaningful practices address the individual needs of the athletes. They blend non-tennis, blocked learning, and random game-like learning activities to ensure greater long-term retention of the skills to competition.

- *Meet the needs of the athlete* - Practices should be designed to meet the needs of the athlete based on a variety of factors such as their skills, level of fitness, performance in competition, strengths and weaknesses, and goals.

- *Non-tennis activities* - All practices must include non-tennis activities. These activities may include such things as announcements, discussions, conditioning, stretching, discussions, injury prevention, chalk-talks, setting up equipment, picking up balls, water breaks, picture day, or conditioning. There are a variety of ways to minimize the time spent on these activities during practice.

- *Optimize the number of random game-like activities and contacts* - The term optimize means to make the best use of a resource. An optimized practice will blend the non-tennis, blocked learning, and random learning activities to meet the needs of the athlete. This usually means limiting the time spent of non-tennis and blocked activities and focusing on the needs of the athlete.

- *Random learning activities* - When coaches teach a specific skill, they often combine several skills and the relationship between those skills to teach the specific skill. In random learning activities, the athletes must read the ball, make adjustments, and solve problems. For example, in a drill designed to improve a player's backhand, the coach have the player hit both forehands and backhands, with a majority of the shots being backhands. The learning is further enhanced when the activity is game-like, a learning environment is created where enhanced discovered learning takes place, athletes are encouraged to operate in a growth mindset, and learn from their mistakes.

- *Read the ball* - Coaches teach athletes to observe the height, spin, trajectory, pace, and direction of the ball. Random learning activities are effective because they require athletes to read the ball and react.