Subjective Assessment of Observable Incidents of Antisocial Behavior During a Random Sample of CDTA/NITA Sanctioned Tournaments

Event (N/C)	M	Viewing	Player							Parent						TM
		O/C/P/D	1	2	3	4	5	6	7	1	2	3	4	5	6	
N L2 G 12	1	O/P	1		1						1		1	1		8
N L4 B 10, 12,14,16 G10		O/P														47
		O/P														8
N L4 B14, 16		O/P														11
N L4 B 12, 16 G 10, 16	1	O/P	1			1								1	1	20
	2										1					
C L4 B 12-16 G 12-14	1	O/P							1							40
	2		1						1							
	1														1	23
	2				1				3							
C L4 B14, 18 G 12	1	O/D	2													20
6 events	8		5		2	1			5		2		1	2	2	177

Table 1

Legend: Event: N=NITA, C=CDTA; M: match#; Viewing: Open, Closed, Proximal, Distal; TM: total # of matches for the day

Player behavior:

1. Questioning line call with **accusatory** tone such as “that ball was not out!”
2. Degrading/derogatory remark directed toward or about opponent after point
3. Disrespect for authority such as questioning official’s decision e.g. overrule
4. Throwing racquet (as opposed to dropping)
5. Verbal/visible obscenity
6. Taunting
7. Other i.e. manipulating score; disrespecting spectator

Parent/coach behavior

Inappropriate parent/coach involvement (during/after play) with:

1. Own player
2. Players’ opponent
3. Opponents’ parent/coach
4. Official
5. TD
6. Reaction to line call

[The above chart shows that during 6 CDTA/NITA events, external direct observation of play revealed only 20 incidents of problem player/parent behavior (as described in the above legend) involving 8 of 177 matches played.]

Junior Tournament Supervised vs Unsupervised Play (September 2014-April 2015)									
Matches	Start of play	Finish	M1	M2	M3	M4	Avg match length (mins)	Avg direct observance	
10	9:15a	4:50p	1:52	1:19	:50	1:05	77*	19*	
8	2:10p	5:45p	:24	:54	1:24	:42	51	13	
8	6:15p	9:15p	:35	:45	:55	:47	46	12	
17	2:05p	9:20p	:50	:33	:59	1:07	52	13	
4	2:15p	3:30p	:44	1:10			57	29	
8	5:15p	9p	1:03	1:18	1:36	:55	73	18	
4	1:15p	5:00p	:58	1:06	1:22	1	67	17	
7	6:30p	9:40p	1:02	1:02	:41	:56	55	14	
17	3:20p	9:20p	2:06	1:04	2:05	1:05	95	24	
6	2:15p	7:00p	1:12	1:08	1:20	1:36	79	20	
17	5:25p	10:00p	:49	:45	:30	1:07	48	12	
12	5:10p	8:30p	1:28	1:31	:28	:49	64	16	
2	6:00p	6:45p	:45	:45			45	23	
8	7:10p	9:00p	:40	:46	1:18	1:38	66	17	
12	5:10p	8:40p	1:04	1:10	:44	1:11	62	16	
6	11:40a	7:40p	1:15	1:15	1:20	:42	68	17	
2	4:10p	6:00p	1:18	1:52			95	48	
13	3:45p	9:15p	1:03	1:57	:52	:57	72	18	
17	3:35p	9:40p	:55	:48	:54	1:34	63	16	
26	2:40p	8:30p	1:00	1:29	2:35		101	34	
11	5:10p	9:35p	1:20	1:30	:40	:58	67	17	
2	10:05a	11:30a	:52	1:19			66	33	
22	3:05p	9:50p	:47	1:00	1:13	1:00	60	15	
16	6:10p	10:25p	1:08	:58	1:20	:54	65	16	
22	12:10p	10p	1:24	1:52	1:05	2:13	99	25	
4	2:05	6:05	1:05	1:12	2:03	2:28	102	26	
281							(69)	20 mins SD = 8	

*Figures rounded to nearest tenth

Subjective Quantitative Measure of Interpersonal Communication Between Opponents During a Random Sample of CDTA/NITA Tournaments

Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
G L4 14	1:04		V	I	V	I				
		A	23	11	12	5	15	22		1
		B	29	11	7	11	1	40	1	
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L 4B 12	1:16		V	I	V	I				
		A	56		38		10	52		
		B	53	6	33	13	1	53		
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L4 B16	54		V	I	V	I				
		A	19	22	12	16	3	47	1	
		B	35	6	24	7	5	30	2	
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L4 G16	:41		V	I	V	I				
		A	35	3	24	7	4	18		
		B	17	7	16	5		43		
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L4 G12	1:31		V	I	V	I				
		A	43	11	38	13	8	61		1
		B	58	2	40	8	6	54	1	
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L3 G12	:57		V	I	V	I				
		A	9	34	24	13	22	35	2	1
		B	11	25	20	27	1	37	1	
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L3 G12	:48		V	I	V	I				
		A	5	27	10	8	22	19		1
		B	25	1	16	22		32		5
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L3 G 14	1:00		V	I	V	I				
		A	25	3	43	2	13	27	4	
		B	35	9	13	22	2	44	1	
Event	Time	Player	Score		Line call		Winner	Error	QLC	QS
L2 G 12	:44	A	V	I	V	I				
		B	19		3	2		37	1	
			17	1	16	3	4	4	1	
Table 3										

Legend: V/I (verbal/implied communication); QLC/QS (questioned line call/score)

During 8 matches 507 instances of interpersonal communication occurred. Score: verbal 146/implied 100; Line call: verbal 145/implied 99; Questioned line calls 10; Questioned score 7

Winner/error ratio: 64/235 = approximately 1/5 (21%)

Vision Research

Accuracy of Player Line Calls During Sanctioned Junior Tournament Play

Purpose

To investigate the accuracy of player line calls made during sanctioned junior tournament play.

Methods

From June 2013 to June 2014, line calls were directly observed from the vantage point of a roving official standing at the tennis net post during 33 USTA sanctioned junior tournaments encompassing approximately 1100 singles matches. The following chart reflects player responses on balls landing on or near a service line, baseline or sideline during a point:

1. A ball landing on or inside the line called out by the player but overruled by the roving official (columns 4-7)
2. A ball landing out of the boundary of the court but played as in by the player (columns 8-10)

Junior Tennis Player Line Calls
June 2013-June 2014

DATE	L	#M	OVERRULE				OUT BALL PLAYED			TOTALS	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
			B	S	NS	FS	B	S	LL	O	OBP
6/8/10		121	1		1	1	19	24	14	3	57
6/15/16	6	21			1		8	20	1	1	29
6/17-19	6	82			1		5	20		1	25
7/5-7	6	86	2				5	8	1	2	14
7/12	6	51					2	8			8
7/13	6	27		2			1	4		2	8
7/15-17	6	71	4	2			4	7		6	11
7/28	6	7					2	3	1	0	6
9/7	6	16		1			2	22	1	1	25
9/14	6	25			1		2	4	1	1	7
9/22	6	3					5	10	2	0	17
9/27	6	13		1			9	20	5	1	34
11/4	1	12	1		1		2	10	1	2	13
11/8-10	6	42		1			6	25	3	1	34
12/8	7	14					6	12	3		21
1/10	5	19	4	1		1	7	25	1	6	33
1/19	3	13					8	20	1	0	29
2/3	1	12					5	8		0	13
2/8	5	18					4	5	1		10
2/9	5	8					2	9			11
2/16	5	12					3	9		0	12
3/1	2	47		1	1	1	3	10	2	3	15
3/14	5	16		1			7	6	1	1	14
3/21	5	34		1			7	7	1	1	15
4/4-5	5	75			2	2	3	17		4	20
4/18-19	5	14			1		4	12	1	1	17
4/20	3	15	1				1	6	4	1	11
4/25-26	5	29			1		8	27	3	1	38
5/2	5	7			1		6	7		1	13
5/17	5	11					2	6	1		9
5/25-26	2	32	3				4	12		3	16
5/31/6/1	3	48					1	13	4		18
6/8-10	3	99	1		2		17	61	3	3	91
33		**1100**	**17**	**11**	**13**	**5**	**170**	**457**	**56**	***46**	***683**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

1=total number of events; 2=level of event; 3=number of matches observed during event;
4=baseline; 5=service line; 6=near sideline; 7=far sideline; 8=baseline; 9=service line;
10=long line; ***11**= total overruled; ***12**=total out balls played

Results

Based upon direct observance by a roving official standing at the net post during tournament play, 683 (94%) of balls landing out of the boundary of the court were played (not called “out”) and 46 (6%) of balls landing inside the boundary of the court were incorrectly called “out” (overruled).

Discussion

The constant threat of balls landing near lines during play, combined with the self-governing nature of tournament play and scant officiating presence, adds to the angst experienced by players and adult stakeholders. And when winning as a desired outcome is added to the mix, mistrust and allegations of cheating expressed by players and stakeholders during play becomes inevitable. **Empirical (subjective)** evidence indicates that over the course of play, the overwhelming majority of incorrect line calls appear to be made *in favor of one’s opponent.*

The Effect of Visual Acuity Degradation on the Visual Judgment of Sport Officials

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Purpose

The purpose of this study is to investigate the effect of visual acuity degradation on the judgment of sport officials. Visual acuity is the ability to clearly and distinctly see a stationary object enabling the identification and discrimination of certain objects at a distance. Visual acuity will be analyzed by a standard visual acuity wall chart. Visual judgment will be determined by a tennis ball line test where subjects had to determine if balls were judged as "in" or "out."

Subjects

Twenty-two Texas A&M University – Corpus Christi sport officials from the intramural department, (age 20.86 ± .85 yrs.) participated in a line calling drill of 30 balls verbally stating, “in” or “out” for each ball. Of the twenty-two officials, 27% (n = 6) were females and 72% (n=16) were males. All subjects had two or more years of experience in officiating a variety of intramural sports. Subjects were not allowed to wear glasses but

could wear their contact lenses due to the posttest's demand of wearing the powered reading glasses.

Methods

Testing was administered at Texas A&M University – Corpus Christi's Biomechanics Laboratory. Visual acuity was measured with an established visual acuity chart, the GUARDVISION™ 2012 LIFEGUARD VISION TEST #A apparatus. The pretest was performed with normal vision and the posttest was performed with a set of powered eye glasses (ranging from +1.75 to +2.75) designed to degrade vision to 20/50. The test protocol utilized a test administrator randomly dropping tennis balls on a line from a distance of 11.69m from the subject. The balls were intentionally dropped within three inches of the line to challenge the subjects to make the correct "in "or "out" call. Each subject was required to judge 30 line calls.

Statistical Analysis

Means and standard deviations were calculated for both the pretest and the posttest. A paired-samples t test was calculated to compare the mean pretest (normal vision) score to the mean posttest (degraded vision) score. The statistical software package SPSS version 19.0 was used for the data analysis. The alpha level was set at $p \leq 0.05$.

Results

The twenty-two Texas A&M University – Corpus Christi sport officials (age 20.86 ± .85 yrs.) participated in visual acuity and line call tests. A paired-samples t test was calculated to compare the mean pretest score (normal vision) to the mean posttest score (degraded vision). The mean pretest score was 25.73 ± 2.16 and the mean posttest score was 16.91 ± 3.22. The results of the paired-samples t test determined a statistically significant difference between the pretest and posttest scores $t(21) = 2.69$, $p < .05$). In addition, subjects experienced an average of 34% more incorrect line calls when their vision was degraded to 20/50.

Discussion

The results of this study indicate that visual acuity degradation of sport officials to a level of 20/50 significantly reduces the ability to make correct line calls. The average subject experienced 34% more incorrect line calls with visual degradation. This is important to

note since it is not uncommon for sport officials to work sport contests with acuity levels as low as 20/50 or more. Based on the results of this study it is recommended that all sport officials be administered standard visual acuity testing. It is also suggested that sport official governing bodies consider visual skills testing in addition to visual acuity testing for all sport officials. Suggestions for further research include testing the visual judgment of sport officials while they are in a dynamic state of motion (e.g. basketball, soccer, etc.)

Conclusion

The Texas A&M study demonstrates how trained sports officials, even under controlled conditions, are prone to err when making tennis line calls. If incorrect line calls are made by adults under these conditions, one can surmise that junior tennis players might also be prone to err when attempting to do so under the stress of competition. Research literature related to vision neurology has brought to light a number of significant variables that affect visual performance. What follows is a description of a few of these variables and how they might connect to the junior tournament experience.

The level of visual activity called upon by the demands of sports activity is referred to as *visual acuity*. An apt distinction between vision and visual acuity comes from Dr. Donald Getz (Z Health, 2011), who posits that vision is *"…the understanding of what is seen, and involves the ability to take incoming visual information, process that information and obtain meaning from it,"* and Daniel Gomez (May, 2013) et al who posits that visual acuity is *"…the ability to clearly and distinctly see a stationary object enabling the identification and discrimination of certain objects at a distance."*

The variables that affect visual acuity are too numerous to present in such a brief report. Thus what follows are five that may be most easily understood by players, parents, tournament directors, and officials.

Visual activity initially breaks down into 2 types: *static* and *dynamic* (Knudson, 1997). Static visual acuity (SVA) is simply observing a stationary object while you (the observer) are at rest. Dynamic visual acuity (DVA) brings motion into play. Either you (the observer) are in motion; the object being observed is in motion, or both. So when it comes to visual accuracy, as demonstrated by the Snellen eye exam (Knudson, 1997), even SVA is finite. The further down the chart you go, ability to see fine detail will

invariably max out. Once you add motion – either the observer or the object being observed – the point at which this occurs becomes accelerated.

Visual attention may be considered the focal point of visual acuity. In terms of vision science, the point at which both eyes focus on a single point is described as a *fixation*. A fixation, in turn, is shaped or influenced by what is described as a *visual field* or *arc* which is limited to 3 degrees (Knudson, 1997). With the size of the visual field about the width of the tip of a thumb, this suggests that peripheral vision becomes part of the equation when visual attention is called for.

Another variable that influences visual acuity is *vantage point*. This is the position of the observer relative to the object being observed. The importance of positioning when engaging visual acuity was articulated in 1983 where researchers at Vic Braden's Tennis Academy determined that *angular positioning had a direct impact on visual accuracy* (Braden, 1983). And later research has added that even unlimited viewing time doesn't totally eliminate the potential for inaccuracy.

Another critical variable that impacts visual acuity is *interference*. Interference emanates from a number of sources. These sources have been categorized as the "*Visual Superhighway"* (Seiller). Engaging visual acuity involves integration, interpretation, and processing of visual information, and anytime something from the environment or physical make-up of the observer interrupts the activity of the visual field, visual accuracy may be compromised leading to potential visual error. Interference may be caused by *fatigue* due to the length of a sporting event, *pressure* arising from decision-making at critical moments during play, as well as *lack of experience* or *limited ability*.

When juxtaposed on junior tournament play it becomes evident that a lot is going on with a player's visual performance that is likely to affect accuracy before it can be ascertained that an incorrect line call was a deliberate act. Think of the situation. When making a line call a player may be *in motion* or *poorly positioned*, both of which affect visual accuracy. The *speed* of the shot may compromise *fixation* (where both eyes focus on a single point) causing the player to rely on *peripheral vision* to make the line call. (In terms of visual attention, peripheral vision is less reliable than fixation). How about *experience* and *ability*? During a point, for an inexperienced player or one possessing immature physical skills, the necessity of (mentally) tending to simple execution of a shot may compromise visual accuracy. And let's not forget *fatigue*. During the course of

the day visual skills may diminish due to physical conditions e.g. prolonged exposure to heat or the number of matches being played.

The findings in the Texas A&M study show that variables affecting the visual accuracy of players also affect roving officials. Under controlled trial conditions visual accuracy is about 66%. This becomes significant when transposed on to match conditions, as research has shown that positioning at the tennis net post affects the visual accuracy of a roving official. It also stands to reason that experience, speed of play, as well as fatigue may also play a role.

Understanding the challenges to visual accuracy, one can extrapolate that incorrect line calls are inevitable, due in large part to limiting factors connected to the human system. With sanctioned junior tournament play, while the possibility of mal intent may exist, vision science provides credible evidence suggesting another reason for incorrect line calls: *error probability due to the effect of visual degradation.*

Accuracy of Line Calls made by Professional Line and Chair Officials

2013 US Open Line Calls

Match #	Chase review LC	Call overruled	Call confirmed	Chair overrule	Chase review	Overrule confirmed	Overrule reversed
1	3	2	1				
2	4	4		1	1	1	
3	2	1	1				
4	5	3	2				
5	1	1					
6	2	1	1				
7	2		2				
8				1	1	1	
9	1		1				
10	1		1				
11	1		1				
12	3	2	1	1	1	1	
13	4	2	2				
14	3	1	2				
15	3		3				
16	2		2				
17	2	2		1	1	1	
18	3		3				
19	1		1				
20	1		1				
21	4	1	3	2	2	1	1
22	1	1					
23	3	1	2				
24	2	2					
25	5	3	2				
26	3	1	2	1	1		1
27	1		1				
28	1		1				
29	2		2				
30	3	1	2				
31	1		1				
32	10	5	5	2	**	2	
33	2		2				
34	5	1	4				
35	3	1	2				
36	2	1	1	1	**	1	
37	2	1	1	1	**	1	
38	3		3				
39	5	1	4				
40	3	1	2	1	1		1
41	4	2	2	3		2	1
42	3		3				
43	1	1					
44	2	1	1				
45	7	3	4	1	1	1	
46	8	5	3				
47	2	1	1				
48	1		1				
49	4		4				
50	3		3				
51	7	3	4				
52	5	2	3	1	1	1	
53	3		3				
54	1	1					
55	2	2					
56	10	2	8	2	2	1	1
57	1	1					
58	2		2				
59	14	5	9				
60	3	2	1	1	1	1	1
61	3	1	2	1	1		1

62	4	2	2				
63	5	1	4				
64	12	3	9	2	**	2	
65	4	2	2	1	1	1	
66	5	1	4	1	1	1	
67	3	2	1				
68	8	2	6				
69	5	3	2	1	1	1	
70	1		1				
71	7	1	6				
72	11	2	9				
Total	256	91	165	26	17	20	7

*Indicates a line call made and reviewed for television audience but not challenged by player
**Indicates a chair overrule reviewed for television audience but not challenged by player

2014 Australian Open Line Calls

Match #	Chase review LC	Call overruled	Call confirmed	Chair overrule	Chase review	Overrule confirmed	Overrule reversed
1	1		1				
2	4	3	1				
3	*1	2					
4	1		1				
5	7	3	4	2	1		1
6	5	1	4				
7	2	1	1				
8	1	1					
9	3	1	2	1	1		1
10	12	1	11	1		1	
11	3	1	2		**		
12	2	1	1				
13	3	2	1				
14	1		1				
15	4		4				
16	2	1	1				
17	2		2				
18	2	1	1				
19	3		3				
20	2		2				
21	6	2	4				
22	1	1					
23	1		1				
24	5	1	4				
25	2		2				
26	8	2	6				
27	4	1	3				
28	1		1				
29	1		1				
30	4	2	2				
31	1		1				
32	3	1	2				
33	1		1				
34	1		1				
35	1		1				
36	3	1	2				
37	1		1				
38	4	3	1	1	1	1	
39	4	2	2				
40	1	1					
41	1		1				
42	2	1	1				
43	3		3				
44	4	1	3				
45	3		3				
46	1		1				
47	1	1					
48	1		1				

49	2		2				
50	1		1				
51	3	1	2				
52	4	1	3	1	1		1
53	4		4				
54	*5	2	4				
55	5	1	4	1	1		1
56	8	2	6				
57	3	1	2				
58	3		3				
59	1		1				
60	3	2	1				
61	3	1	2	2	2	1	1
62	3	2	1				
63	*5	3	3				
64	10	2	8	1	1	1	
65	4		4				
66	3	1	2	1	1	1	
67	8		8				
68	9		9				
69	5	2	3				
70	3	2	1				
71	11	3	8	1	1	1	
72	6	3	3				
73	2	1	1				
74	2	1	1				
Total	246	70	179	12	10	6	5

*Indicates a line call made and reviewed for television audience but not challenged by player
**Indicates a chair overrule reviewed for television audience but not challenged by player

2014 Wimbledon Line Calls

Match #	Chase review LC	Call overruled	Call confirmed	Chair overrule	Chase review	Overrule confirmed	Overrule reversed
1	2		2				
2	1		1				
3	2	1	1				
4	2		2				
5	1		1				
6	4	1	3				
7	4	1	3	1	1	1	
8	1		1				
9	2	1	1				
10	4	1	3				
11	1		1				
12	4	2	2				
13	1		1				
14	7	2	5				
15	3		3				
16	3	2	1				
17	3		3				
18	4	1	3	2	2	1	1
19	5		5				
20	2		2				
21	6	3	3				
22	2	1	1				
23	1	1					
24	5	2	3				
25	1	1		1	1	1	
26	1		1				
27	5		5				
28	2		2				
29	2		2				
30	1		1				
31	3		3				
32	7	3	4	2	2	1	1
33	5	2	3				

34	1		1				
35	2		2				
36	3		3				
37	5	2	3				
38	6	1	5				
39	2		2				
40	3	2	1				
41	6		6				
42	8	3	5	1	1		1
43	9	1	8				
44	6	1	5	1	1	1	
45	12	6	6	2	2	1	1
Total	160	41	119	10	10	6	4

Total number of televised Wimbledon matches affected by World Cup coverage

US Open 72 matches	256	91	165	26	17	20	7
Aus Open 74 matches	246	70	179	12	10	6	5
Wimbledon 45 matches	160	41	119	10	10	6	4
Total (191) matches	***662	202	463	48	***37	32	16
Percentages		30%	69%			66%	33%
	Call Reviewed	Call Overruled	Call Confirmed	Chair Overrule	Overrule Reviewed	Overrule Confirmed	Overrule Reversed

***Difference in totals reflect line calls and overrules made and reviewed for television audience but not challenged by players