

OPTIMAL AGE for ELITE SPORT

Loris Bertolacci

AIM of Presentation

- 1) AFL is not a truly elite sport due to drafting system. It over manipulates normal elite sports maturational processes.**
- 2) U/18 system should become U/19.5.**
- 3) Development of the average draftee takes longer than the tenure of the average football department.**

OPTIMAL AGE for ELITE SPORT



Craig Bradley 39



Wayne Rooney 16



Roger Milla 42



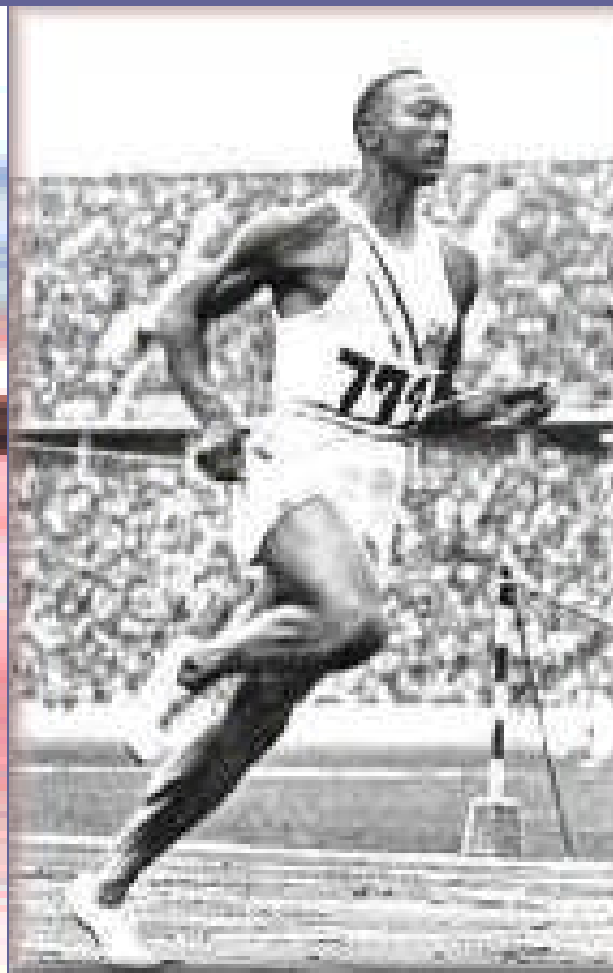
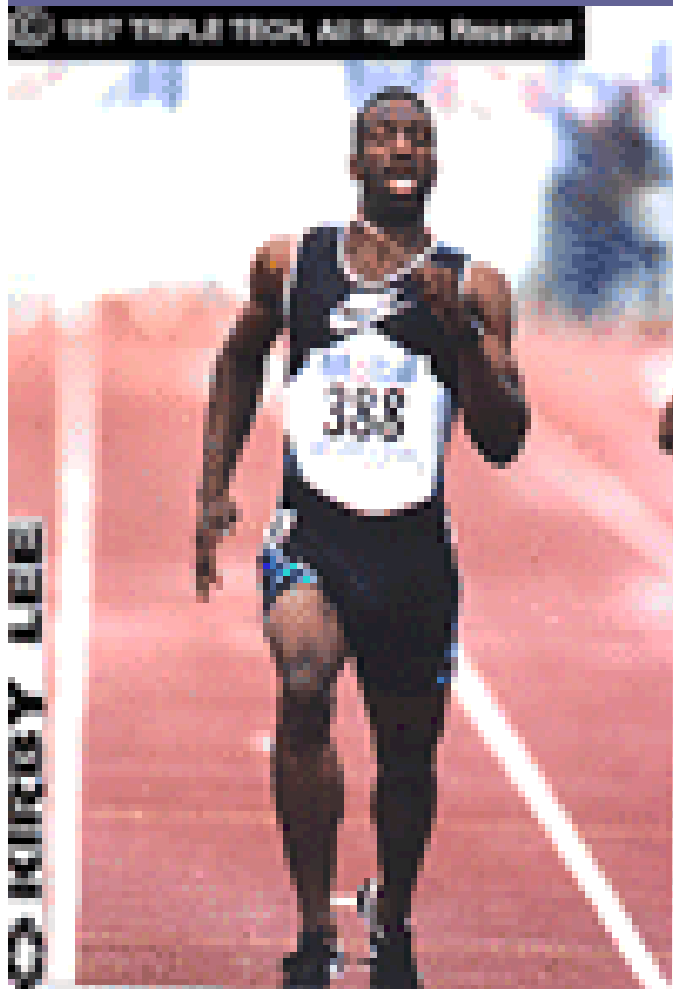
Nick Riewoldt 19.9



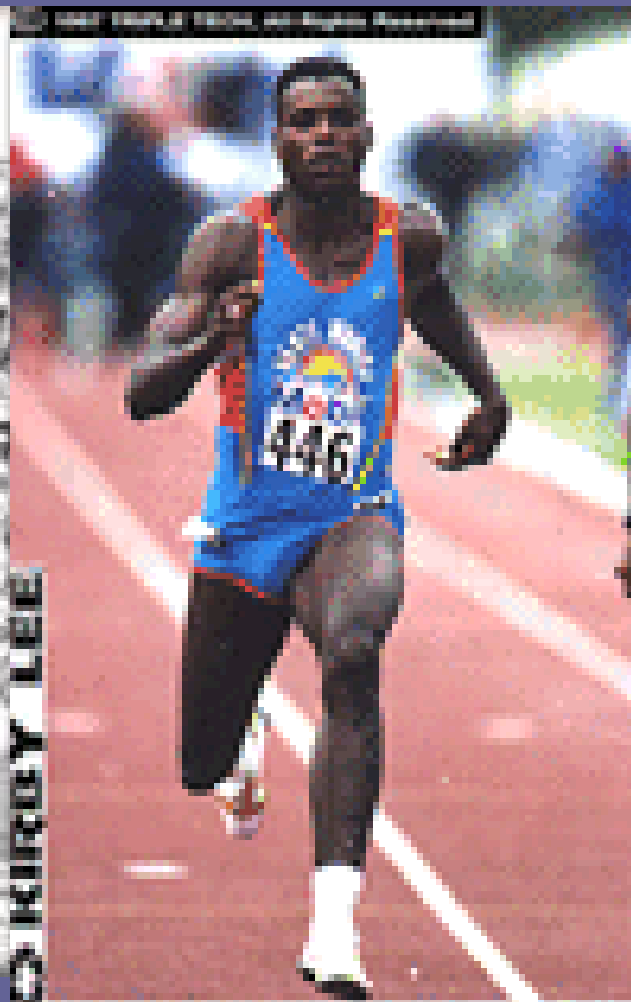


May make ranking lists for “whites” a bit older?

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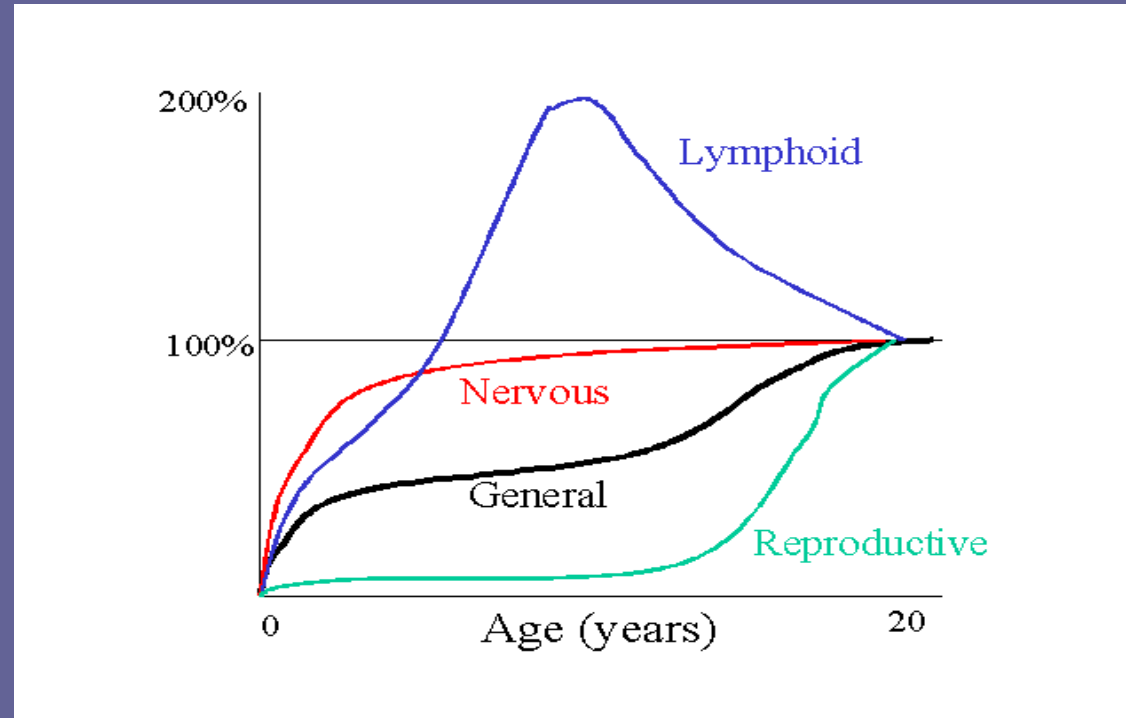


EXCELLENCE

"It takes 10 years of
extensive training to excel in
anything."

Herbert Simon - Nobel Laureate

MATURATION



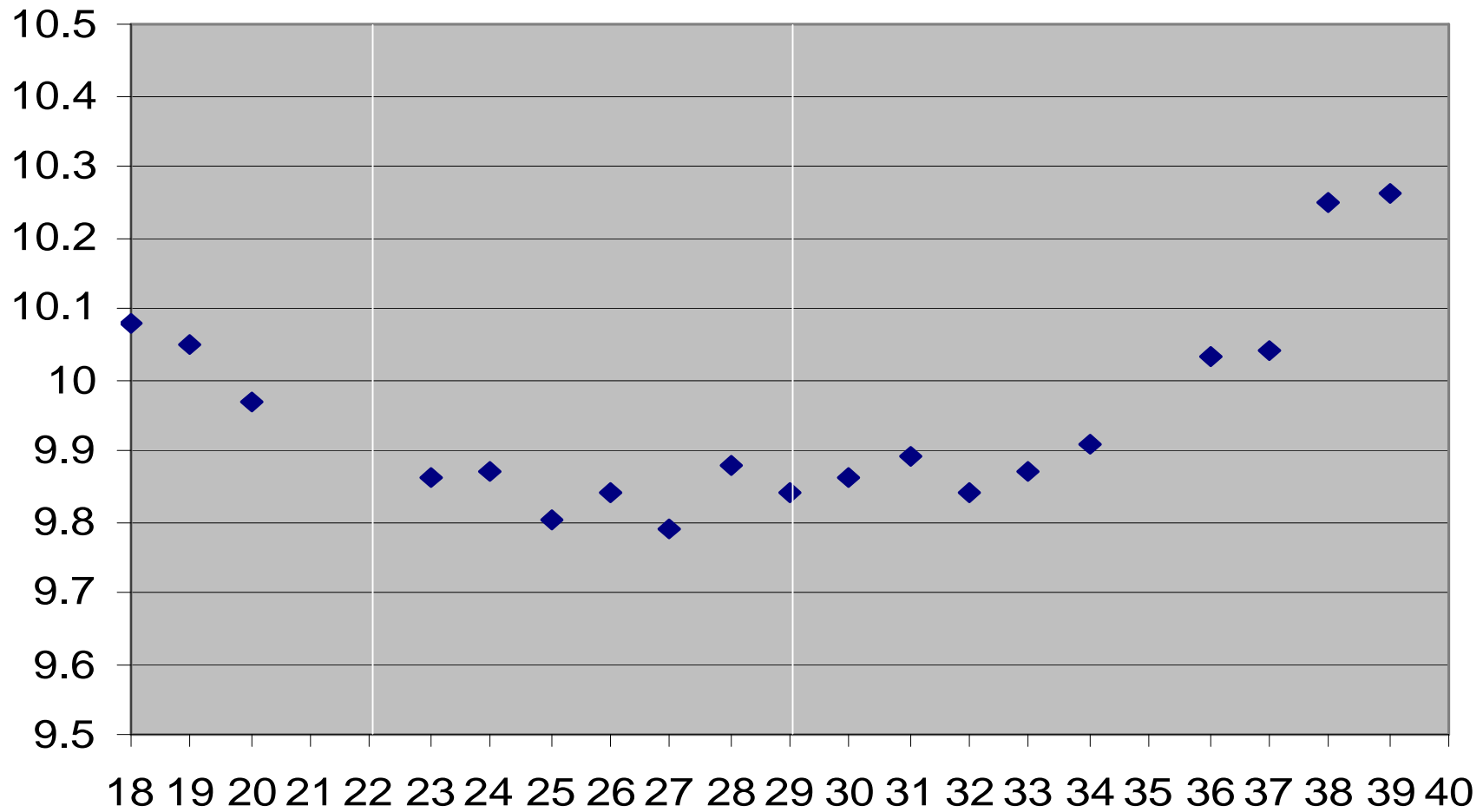
A study of Czechoslovakian males, aged 11-24 years, showed the changes in somatotype during maturation (Carter & Parizkova 1978).

Stage 1 = 11-15 years during which there is decreasing endomorphy and increasing ectomorphy.
Stage 2 = 15-24 years during which there is increased mesomorphy and decreasing ectomorphy.

Lots of evidence of maturational processes continuing till mid 20's.

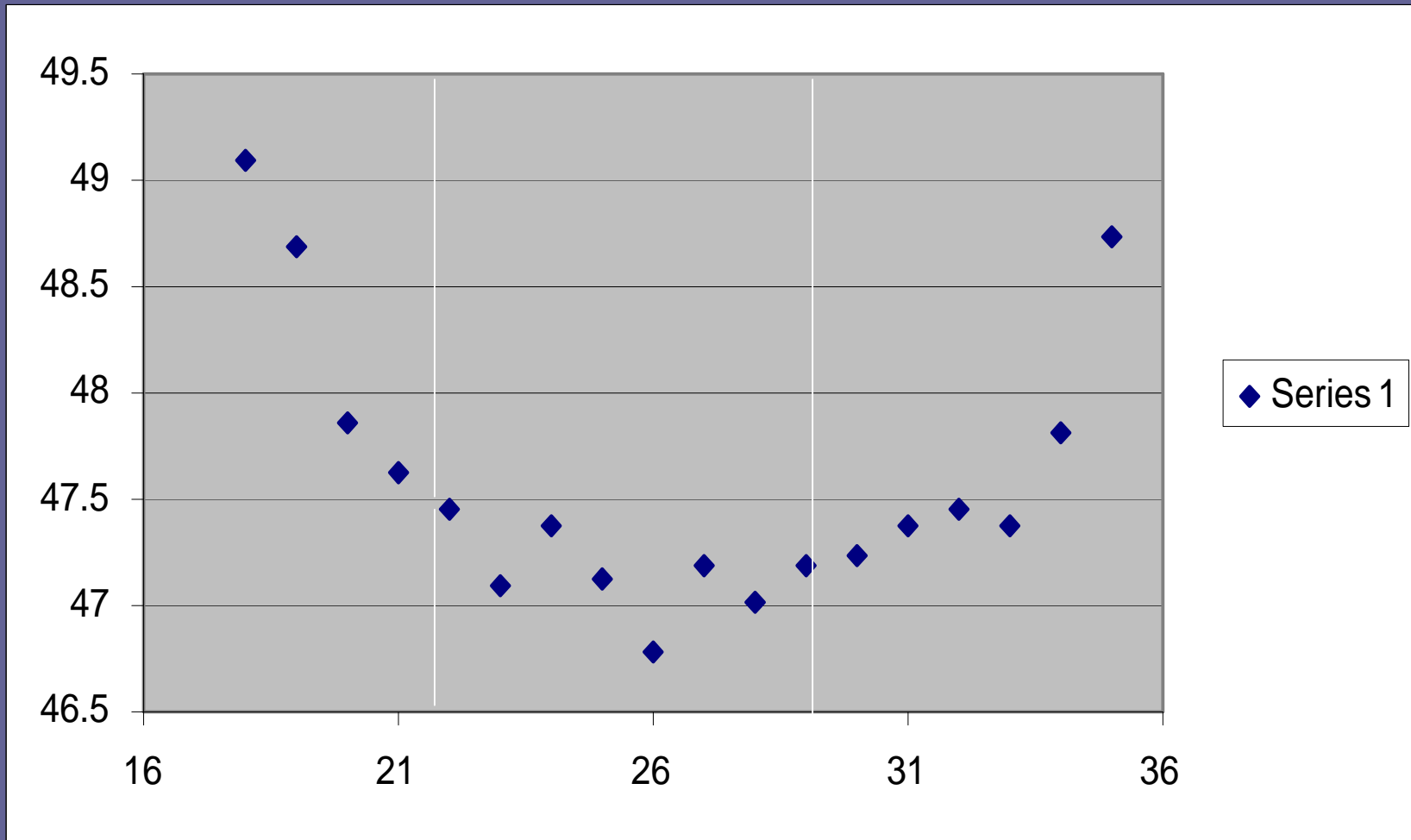
100mAge WorldRecords

Peak Performance Age ?



400mHurdles Record by Age

Peak Performance Age ?



TheFormula forSuccess ...AIS

Oversimplified formula

$$2 \times 7 \times 52 \times 10$$

(Train twice a day, 7 days a week, for 52 weeks of the year, and for 10 years)

(A number of these training sessions would be dedicated to athlete recovery!)

The 10 Year Rule AIS

- AIS TALENT SEARCH assumes a genetic basis to talent.
- BUT developmental psychologists (eg Ericsson and colleagues) believe it is possible for anyone to attain excellence in any field of endeavour (sporting, academic, music).
- As a rule it takes 10 years or 10,000 hours of sustained deliberate practice.
- Deliberate practice means that the training is well defined and structured, is goal oriented, has sufficient repetition, considers correction of errors, and interestingly, is not necessarily enjoyable.

Tudor Bompa: Common Sense

“During an athletic life, the dynamics of physical and psychological development alters quite frequently and the motor and physiological functions reach an optimal level between the ages of 25-30 for men.”

6 Pre-Seasons for normal draftee in AFL vs 3 pre-seasons for US College Students before drafting!

(P234, Theory and Methodology of training, Tudor Bompa.)

Foundation Period

(Model by Brooks)

Begin in a range from 9 to 11 years.

3 to 4 years in duration.

- Games and fun activities, wide variety designed to enhance self-image.
- General training, speed development, skill development.
- Develop body weight strength, mobility, and aerobic endurance.
- Develop basic skills and rhythm.
- One training session per week increasing to three per week.
- Competition should be limited and confined to playful situations

(Brook, N.D., "Conditioning and the Growing Athlete," Athletics Coach, Vol 19 #4, Dec 1985, PP. 31-35.)

Developmental Period

(Model by Brooks)

Begins in a range from 13 to 14 years.
4 to 6 years in duration

*** Could last till 20 YO (ie 14 + 6)**

- Emphasize general training in the first years.
- Percentage of specific training should increase gradually over the last two years.
- Develop appropriate training and competition behaviour.
- Begin goal setting appropriate to level of development.
- **Teach weight training techniques with 60% maximum loading.**
- Three training sessions per week increasing to six in later years.
- Undertake more formal competition increasing in difficulty as the athlete advances through the developmental period.

(Brook, N.D., "Conditioning and the Growing Athlete," Athletics Coach, Vol 19 #4, Dec 1985, PP. 31-35)

Mature Participation

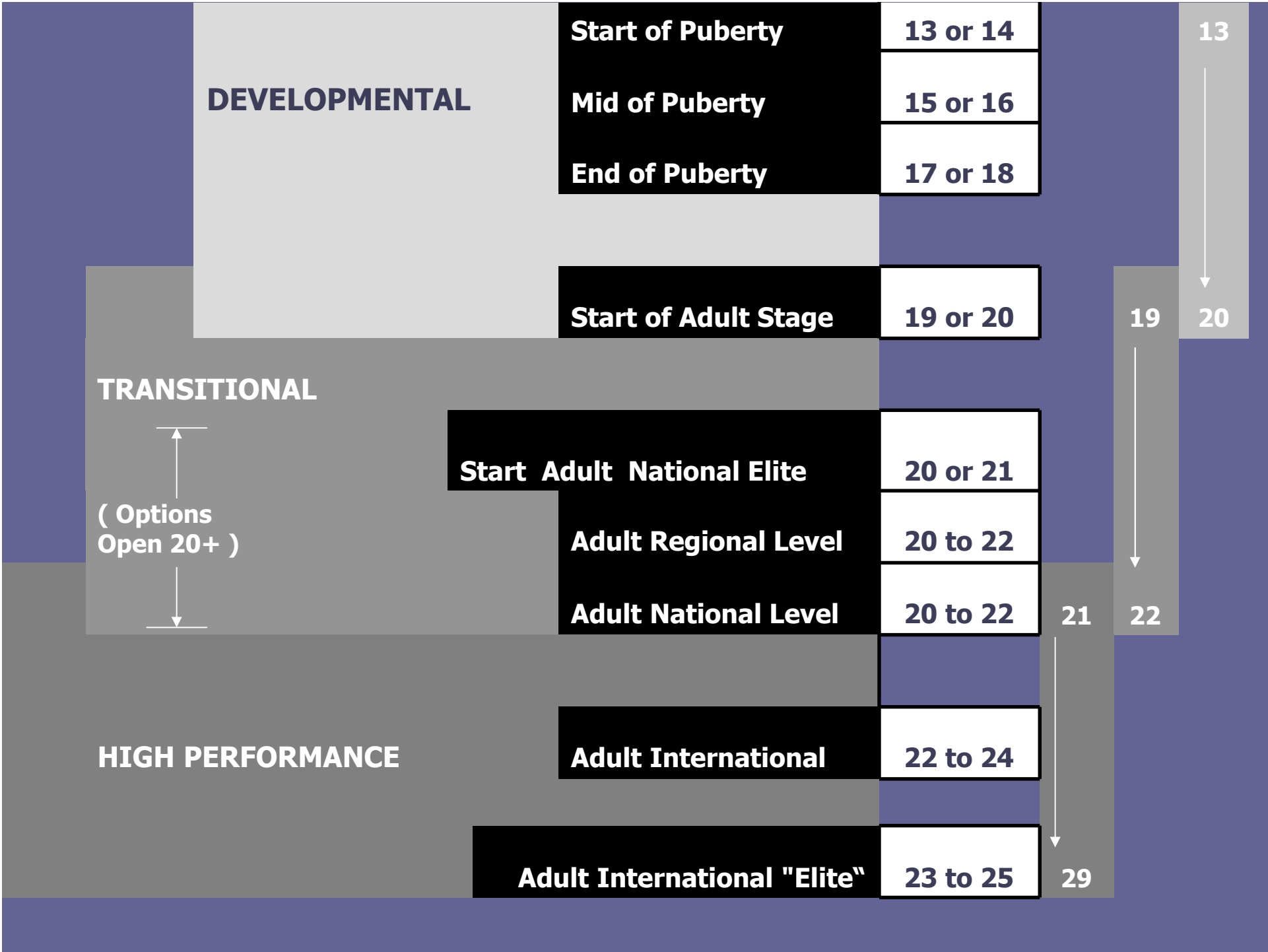
(Model by Brooks)

**Begins in a range from 17 to 22 years.
Not before 17 or after 22.**

(Thus assumes Development period could take up to 22.)

- Percentage of specific training increases.
- The time spent in training increases significantly, especially for the elite athlete.
- Frequency and difficulty increases significantly.

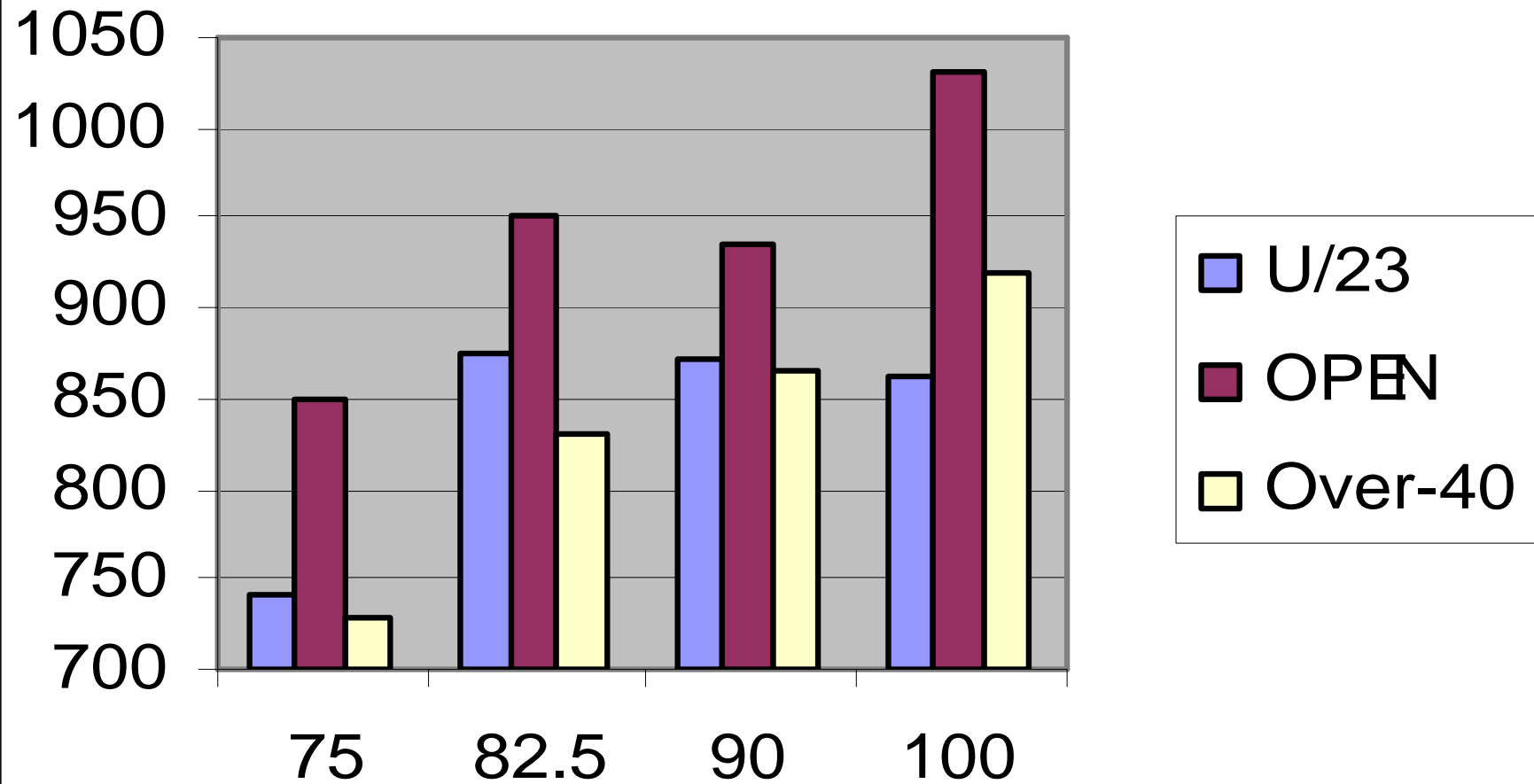
(Brook, N.D., "Conditioning and the Growing Athlete," Athletics Coach, Vol 19 #4, Dec 1985, PP. 31-35)



Powerlifting “The Grunt Factor”



PowerLifting WorldRecords



POWERLIFTING OZSTYLE

TOTAL (Bench/Squat/Deadlift)

	OPEN	U/23	U/20	
82.5 to 90	710	593	605	82.5 to 90
90 to 100	707	720	685	90 to 100
100 to 110	960	818	623	100 to 110

BENCH PRESS

	OPEN	U/23	U/20	
82.5 to 90	210	155	125	82.5 to 90
90 to 100	198	170	155	90 to 100
100 to 110	245	215	150	100 to 110

% Strength of 24-32 yo

U/20	80% of OPEN
U/23	90% of OPEN

% Bench Press of 24-32

U/20	65% of OPEN
U/23	82% of OPEN



TOTAL (Bench/Squat/Deadlift)

	24-32	20-23	18-20
181	1906.75	1548.5	1499
198	1956	1708.5	1554
220	2017	1785.5	1686

BENCH PRESS

	24-32	20-23	18-20
181	512.5	407	380.25
198	540	435	391
220	568	490.5	385.7

% Strength of 24-32 yo

18 to 20	80% of 24-32
20 to 23	85% of 24-32

% Bench Press of 24-32

18 to 20	71% of 24-32
20 to 23	82% of 24-32

BENCHPRESS (OZ& US)

UNDER20

30%of OPENAGE

UNDER23

18%of OPENAGE

* These percentages decrease for international rankings and further drop for Top 10 lists.

CHINUPS

Some 1997 Results

O'Donnell	12
Blumfield	11 (Bench 122.5)
Bolton	1 (10kgs) (Bench 75)
Hird	12
JohnsonJ	7
Solomon 92kgs BW	1 (Bench 105)
Hardwick	3
AVECHINS 20kgs	7

NAME	ChinsBW	Pushups
Ablett	7	30
Bartels	8	42
Gardiner		
JohnsonS		
Kelly		
McCarthy		
Playfair		

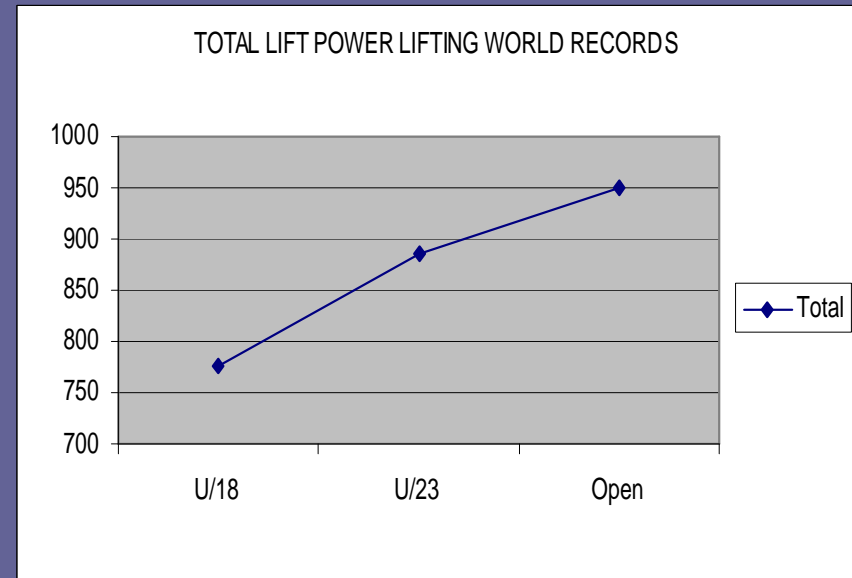
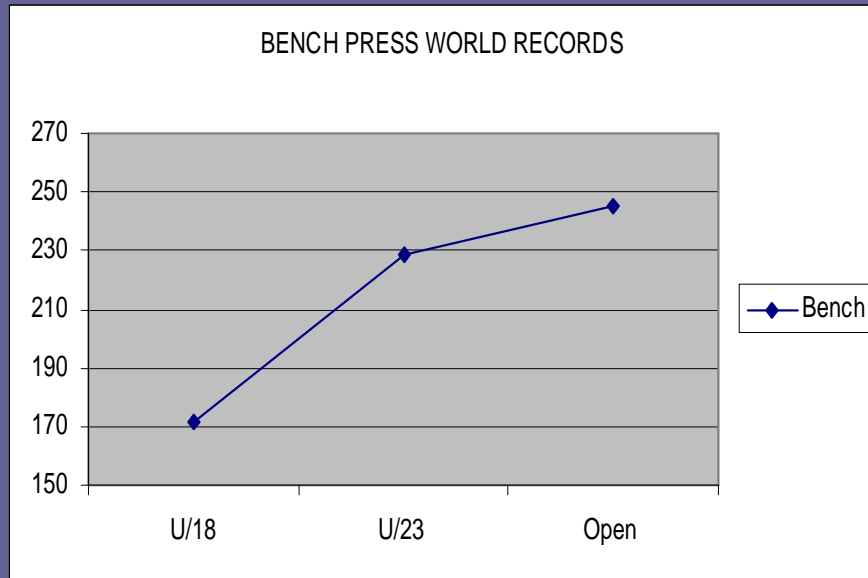
PUSHUPS LIST AVE GFC

GeneralDetails

Alessio 8/11/71		Hird 4/2/73		Cransberg 29/7/67		Wild 10/2/76		Fletcher 7/5/75	
Nov 92 21	75	Dec 91 19	95 Chins 12	Nov 91 24	77.5 VJ 64	Jan 94 18	1500 4.43 Bench 70	Nov 92 17	57.5
Mar 93 22	95	Mar 93 19	102.5 Chins 14	Mar 93 25	92.5	Buckley 26/7/7		Mar 93 18	72.5
Nov 93 23	107.5	Nov 93 20	112.5	Nov 93 25	95	Dec 93 21	Bench 125 Clean 115	Nov 93 18	97.5
Feb 94 23	110	Feb 94 21	120	Feb 94 26	97.5	Hotten		Nov 94 19	102.5
1995 24	127.5	Nov 94 22	115	Nov 94 27	110	Dec 93	Bench 85 1500 4.41	Nov 95 20	105
1996 25	127.5	Dec 95 23	120	Dec 95 27	112.5			Mar 96 21	110
1997 26	130	Mar 96 23	127.5	Mar 96 28	120	S. Johnston GFC		Dec 97 22	122.5
		1997 bulked up!	142.5	Feb 97 29	125	Dec 01 Feb 02	3km 10 20 Bench 100		

POWERLIFTINGWORLD Top 10

Decreased effect of Age at Top of Gene Pool



BENCH

U/18 25% < U/23

U/18 30% < OPEN

U/23 8% < OPEN

TOTAL

U/18 13% < U/23

U/18 19% < OPEN

U/23 10% < OPEN

STRENGTH U/20 vs OPEN

UPPER BODY STRENGTH U/20 vs Open

20-30% LESS

GENERAL BODY STRENGTH U/20 vs Open

15-20% LESS

* Note that all of the above are highly trained lifters.

STRENGTHU/20 vsOPEN

HORMONAL CONSIDERATIONS ?

Possibly higher levels of plasma testosterone, which is anabolic, theoretically contributing to greater muscle mass, lower fat, and the ability to perform at a higher level of intensity with quicker recovery.

MATURITY19 vs26 ?

LIMB LENGTH

Therefore, the difference was in lower limb length and these long bones of the limbs fuse last in growth. These results suggest that the upper body or trunk has developed to maturity because of similarity, but the limbs have not. This could reflect the incomplete maturation of the junior males.

HORMONAL CONSIDERATIONS

Less Testosterone? Non-Responder effect?

Possible deductions?

Upper Body same size but less hormonal influence.

Legs incomplete maturity thus unable to perform at same level or prone to injury.

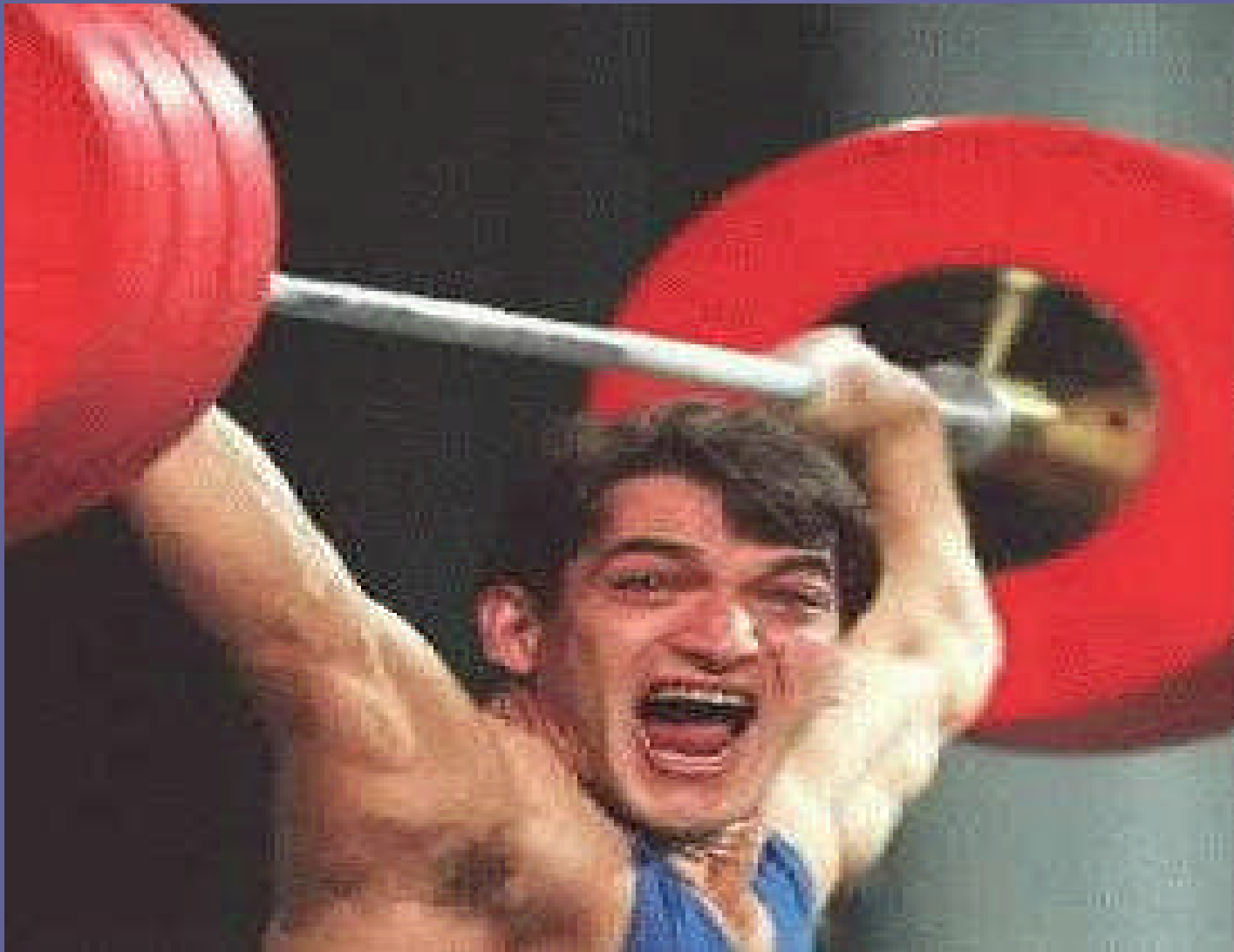


Karelin, known as the “Meanest Man in the World”, was the three-time defending gold medallist

“Reverse body lift”

“he would hoist his opponent as if they were an inanimate object and slam them on their back for a 5-point takedown.”

OLYMPICWEIGHTLIFTING



OLYMPICWEIGHTLIFTING OZ

OPEN RECORDS

U/20 RECORDS

<u>77kg Class</u>		77kg Class	
Total	327.5	Total	265
<u>85kg Class</u>		85kg Class	
Total	377.5	Total	287.5
<u>94kg Class</u>		94kg Class	
Total	392.5	Total	275
<u>105kg Class</u>		105kg Class	
Total	377.5	Total	275

U/20 75%of OPENRECORDS

USAWEIGHTLIFTING

OPEN RECORDS

U/20 RECORDS

77kg		77 kg	
Total	342.5kg	Total	342.5kg
85kg		85 kg	
Total	360.0kg	Total	352.5kg
94kg		94 kg	
Total	372.5kg	Total	330.0kg
105kg		105 kg	

U/20 88% of OPEN RECORDS

- Same lifter has records in U/20 & Open.

TRACK and FIELD

IAAF Ages at 1/6 of year

GAMES IAAF GRAND PRIX FINAL - PARIS 2002

100m MEN

WIND

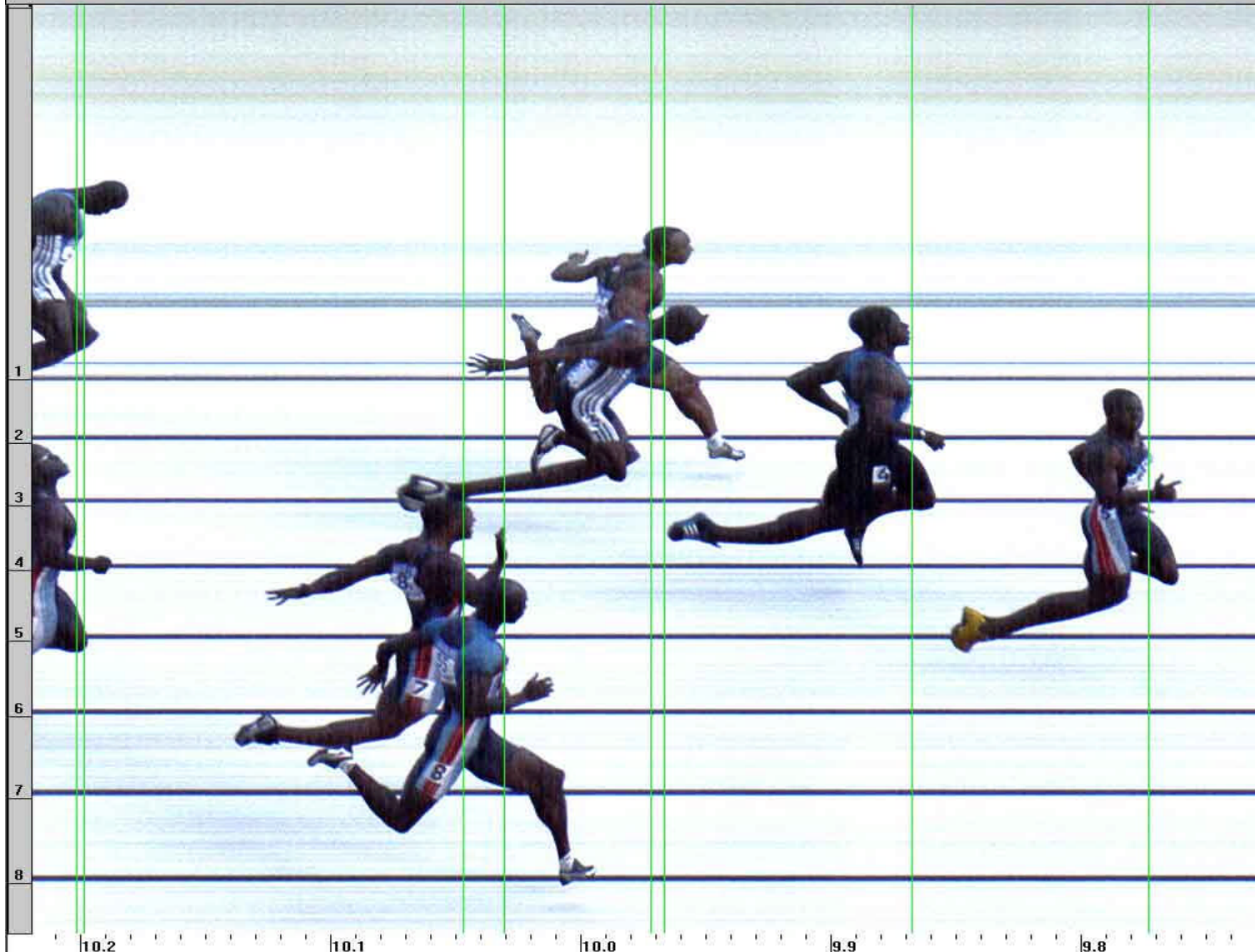
START 16:28 AU.

LN NUM. TIME

PLACE LANE NUMBER

TIME

1	79	9.78
2	19	9.87
3	72	9.97
4	60	9.98
5	55	10.03
6	85	10.05
7	25	10.20
8	78	10.21



100m MEN

*KEYRECORD

SEIKO

OZ U/20 (Equals 2nd Year AFL Dvt Depending on Relative Age effect)

	2001 Nationals		2002 Nationals	
	Open	U/20	Open	U/20
100m	10.19	10.8	10.3	10.6
200m	20.59	21.44	20.6	21.7
400m	45.87	47.39	45.9	47.4
800m	1.47	1.53	1.49	1.52
1500m	3.41	3.52	3.41	3.52
High Jump	2.22	2.11	2.22	2.15
Long Jump	7.97	7.72	7.94	7.37
Triple Jump	16.98	14.81	16.53	14.94
Shot Put	18.48	17.76	19.22	16

100mTop 50World & Oz Top 36

	All Time	2000	2001	2002	OZ n=36
Ave Age	25.1	25.82	26.4	25.5	23.5
1 SD	2.8	3.8	4.3	3.7	4.1
> 30	2	5	5	5	1
< 20	2	3	3	4	11
Range	9.79-10.02	9.86-10.16	9.82-10.21	9.79-10.19	10.19-10.90

100m Top 50 World & Oz Top 36

AVERAGES	All Time	2000	2001	2002	OZ n=36
100m	25.1	25.82	26.4	25.5	23.5
Shot Put	2.8	3.8	4.3	3.7	4.1
High Jump	2	5	5	5	1
1500m	2	3	3	4	11

1500m(top 50)

	All Time	2000	2001	2002	OZ n=36
Ave Age	25.9	25.3	25.7	24.8	24
1 SD	3.2	4.3	3.9	3.7	3.6
>30	5	10	6	8	3
<30	1	3	3	6	6
Range	3.26-3.32	3.27-3.36	3.26-3.36	3.26-3.38	3.37-3.50

ShotPut Top50 (Ozn=19)

	All Time	2000	2001	2002	OZ n=19
Ave Age	26.8	27.8	27.1	26.9	26.1
1 SD	3.6	4.4	4.3	4.3	6.9
>30	11	16	12	9	6
<20	1	0	1	1	4
Range	23.12-21.33	22.12-19.91	21.97-19.59	22.5-19.78	20.97-13.71

HighJump Top50 (Ozn=18)

	ALL TIME	2000	2001	2002	OZ n=18
AVE AGE	24.5	25.4	24.6	25.2	22.5
1 SD	2.8	3.6	3.8	4.1	4.4
>30	3	4	5	5	
<20	3	3	3	6	4
Range	2.45-2.34	2.40-2.25	2.37-2.25	2.37-2.25	2.25-2.05

EUROPETOP 10ALL TIME

U/23 are almost the same but at this “best of the best” level still always lower.

	OPEN	U/23	U/20
	Ave Performance/ Ave Age	Ave Performance / % Diff Open	Ave Performance / % Diff Open
100m	10.01	10.10 / 1%	10.19 / 3%
1500	3.30.4	3.32.7 / 2%	3.38 / 7.5%
HighJump	2.39	2.37 / 3.5%	2.31 / 3.5%
ShotPut	22.37	21.29 / 5%	19.62 / 13%

EuropeTop 102000/2001/2002

	OPEN	U/23	U/20
	Ave Performance / Ave Age	Ave Performance / % Diff Open	Ave Performance / % Diff Open
100m	10.11 / 25.4	10.23 / 1%	10.39 / 3%
1500m	3.32.8 / 26.3	3.37.9 / 2%	3.43.6 / 5%
HighJump	2.33 / 25.3	2.25 / 3.5%	2.19 / 8%
ShotPut	21 / 27.6	19.5 / 7%	18.6 / 12%

Possible Model from ELITESPORT

% Difference 19.9 YO (equal to 2nd Yr AFL) vs Mature Athlete

POWER and STRENGTH (Olympic Weightlifting)	12-18 %
GENERAL BODY STRENGTH (Power Lifting / Squat-Deadlift-Bench)	15-20 %
UPPER BODY STRENGTH (Bench Press)	20-30 %
MAXIMUM SPEED (100m)	3-4 %
ENDURANCE (1500m)	5-7 %
ENDURANCE / STRENGTH (3000m Steeple) ? Repeatable Speed?	8-10 %
FUNCTIONAL POWER (Shot Put)	12-17%
JUMPING (High Jump)	7-10%

BRUMBIES 2002

1. Bill Young	28.5
2. Jeremy Paul	25.5
3. Ben Darwin	25.9
4. Justin Harrison	28.4
5. Daniel Vickerman	23.3
6. Owen Finegan (vc)	30.4
7. George Smith	22.1
8. Scott Fava	26.6
9. George Gregan (c)	29.4
10. Stephen Larkham	28.3
11. Andrew Walker	28.8
12. Pat Howard	28.8
13. Stirling Mortlock	25.3
14. Graeme Bond	28.4
15. Mark Bartholomeusz	25.2
16. Damien Flynn	?
17. Angus Scott	24.4
18. David Pusey	23.6
19. Peter Ryan	31.5
20. Travis Hall	29.7
21. Joel Wilson	25.8
22. Julian Huxley	23.3
Average	26.8

RUGBY UNION

Experience

Body Contact

2 > 30

1 < 23

Similar to
NFL

MANCHESTER UNITED SQUAD 2002 as of 1/9/02

Fabien Barthez 31.2 Laurent Blanc 36.8 Nicky Butt 27.6 Luke Chadwick 21.8 Diego Forlan 23.3 Ryan Giggs 28.8 David May 32.2 Phil Neville 25.6 Paul Scholes 27.8 Juan Veron 27.5 Ole Gunnar Solskjaer 29.5 David Beckham 27.4 Wes Brown 22.9 Roy Carroll 24.9 Rio Ferdinand 23.8 Quinton Fortune 25.3 Roy Keane 31.0 Gary Neville 27.6 John O'Shea 21.4 Mikael Silvestre 25.1 Ruud Van Nistelrooy 26.2

AVERAGE AGE 27.0
Youngest Player 21.4
3 Players under 23 in squad.
Rio Ferdinand 23.8 (30 million pounds)



ARSENALwithout SEAMAN

Seaman	39.0
Cole	21.8
Luzhny	34.1
Campbell	28.0
Keown	36.2
Ljungberg	25.4
Vieira	26.3
Silva, Gilberto	26.0
Wiltord	28.4
Bergkamp	33.4
Henry	25.1
Cygan	28.4
Lauren	25.7
Toure	21.5
Average Age	28.5

Arsenal 2
Borrusia -
Dortmund0

Tuesday17
September
2002

*Without
Seaman 27.7

AJAXAMSTERDAM SQUAD2002 as of1/9/02

- Bogdan Lobont 24.6 Hatem Trabelsi 25.6 André Bergdolmo 30.9 Tomás Galásek 29.6 Cristian Chivu 21.9 Aron Winter 35.5 Andy van der Meyde 22.9 Richard Witschge 33.0 Zlatan Ibrahimovic 20.9 Steven Pienaar 20.5 Ahmed 'Mido' Hossam 19.5 Johnny Heitinga 18.8 Maxwell 21.0 Jan van Halst 33.4 Petri Pasanen 22.0 Wamberto 27.7 John O'Brien 25.0 Nikos Machlas 29.2 Jari Litmanen 31.6 Joey Didulica 24.9 Abubakari Yakubu 20.7 Rafael van der Vaart 19.6 Jelle van Damme 18.9 Victor Sikora 24.4 Nourdin Boukhari 22.2 Maarten Stekelenburg 20.0 Henk Timmer 30.8

AVERAGE AGE SQUAD 25

Youngest Player 18.8

11 Players under 23 in squad.

AJAX has definite Youth Policy and develops many of its own players and is very successful.



FREE TRADE SYSTEM

VS

Draft System & U/18

- Average Age Soccer Squads 25-27 (Ave 26.8) for approx 20-30 players in each squad around the World at start of season.
- AFL with rookies in April average of Squads 23.3
- Effect of 2 to 4 years on squads due to U/18 system and Draft.
- Thus AFL is not a truly elite competition!

WORLD CUP 2002

EXAMPLE of ELITE

Average Age Squads

28.2

KOREA youngest

Squad average 27.7

Without goalkeepers 27.3



CRICKET

BEST CRICKET NATIONS

- AVE AGE 28-30

STATE COMP AUSSIE

- AVE AGE 27-28

Mainly technique & psychological traits.

Netball Development Table

STANDARD	AVE	1STDEV 68%	2STDEV 95%
AUSTRALIA Best 8	28.8		
AUSTRALIA TEAM	28.4		
AUSTRALIA DVT SQUAD	23.7		
NZ FERNS Best 8	26.8		
NZ FERNS Team	26.1		
ENGLISH Team	26.32		
AUS / NZ / ENG Teams (n=33)	27	3.5 (23.5-30.5)	7 (20-34)
CBT Squads (all teams)	23.2	3.5 (19-26)	7 (16.2-30.2)
CBT best 8 of all teams	25	3.5 (20.5-27.5)	7 (18-32)
SL Final 4 Squads 2002	24.6	5.6 (19-30.2)	
SL Final 4 Eligible for FInals 2002	25.1	4 (21.1-29.1)	
* Note Final 4 teams are girls eligible for finals, not best 7 or 8.			
SL 2001 GF 2 Teams	23.6		
SL2000 GF Winner	24.6		
SL Champ (all teams) Proposed LorisB	23	4 (19-27)	8 (15-31)
SL Div 1 (all teams) Proposed LorisB	24.5	4 (20.5-28.5)	8 (16.5-32.5)

NFL

Speed / Power / Strength / Game Knowledge

	Green Bay Packers N=56	San Fransisco N=63	Washington Redskins N=64
Ave Age	27.5	26.6	26.9
1 SD	3.7	3	3.9
< 23	1	2	2
< 24	14	9	13
>30	14	12	11
24-30	37	40	38

Development of EFC

<u>94</u>	99	2000	2001
Blumfield	5	6	7
Caracella	5	6	7
Moorcroft	5	6	7
Lucas	5	6	7
<u>95</u>	99	2000	2001
Lloyd	4	5	6
<u>96</u>	99	2000	2001
Heffernan	3	4	5
JohnsonJ	3	4	5
*JohnsonM	3	4	5
McAlister	3	4	5
<u>97</u>	99	2000	2001
Solomon	2	3	4
Bolton	2	3	4
<u>98</u>	99	2000	2001
Ramanauskas	1	2	3
McVeigh	1	2	3
Henneman	1	2	3
Jacobs	1	2	3
<u>99</u>	99	2000	2001
Hille		1	2

<u>EFC 2000</u>	Age	<u>Dvt</u>	<u>DRAFTED</u>
Alessio	29	9	
Barnard	27	8	
Barnes	31	13	
Bewick	32	13	
Blumfield	23	6	1994
Caracella	23	6	1994
Fletcher	25	8	
Hardiwck	28	9	
Heffernan	21	4	1996
Hird	27	10	
JohnsonJ	22	4	*1996
JohnsonM	22	4	1996
Lloyd	22	5	1995
Long	31	13	
Lucas	23	6	1994
Mercuri	26	9	
Misiti	26	9	
Moorcroft	24	6	1994
Ramanauskas	20	2	1998
Solomon	20	3	1997
Wallis	31	13	
Wellman	26	8	
<u>AVE AGE</u>	25.4		
<u>AVE YEARS in SYSTEM</u>		7.6	

MELB

AVE AGE

24.2

AVE YEARS
IN SYSTEM

6.4

IDEAL AFL PROFILE?

Winning & Losing Grand Final Teams 92-2001

TEAMS

Average Age of GF Teams 92-2001 win or lose	Age 25.4
Ave Matches of GF Teams 92-2001 win or lose	105 Matches
70% of GF Teams 92-2001 win or lose	Age 24.6-26.1
95% of GF Teams 92-2001 win or lose	Age 24-26.8
Essendon youngest GF Win team 92-01	Age 24.3
Carlton oldest GF Win team 92-01	Age 26.8

IDEAL AFL PROFILE?

Winning & Losing Grand Final Teams 92-2001

PLAYERS

70% Players in GF Teams (win or lose)	Age 22-29
95% Players in GF Teams (win or lose)	Age 19-32.5
Average number players in GF teams < 22	3.8 players
Average number players in GF teams >29	3.2 players
Average Matches for players <22	40 matches
Ave no Players with 3 years or less AFL Dvt	3 players
Ave years in the AFL system	7 years

AFL FINALS WEEK 1 2002

	COLL	PORT	ESS	WCE	ADE	BRI	MELB	KANG
AverageAge	23.8	25.5	25.2	23.8	24.8	26.3	23.9	25.6
AveMatches	82	94	103	83	92	130	72	114
No < 22	5	3	4	9	3	2	7	6
No >29	0	4	3	4	1	5	1	5
1st year	0	0	1	1	0	0	2	0
2nd year	3	2	1	3	2	1	0	3
3rd year	3	1	1	2	2	1	3	2

GrandFinal 2002

COLL	Age	Games	BRI	Age	Games
Average	24.3	83	Average	26.3	131
No < 22	5		No < 22	2	
No >29	2		No >29	6	
1st year			1st year		
2nd year	2		2nd year	1	
3rd year	3		3rd year		

17-19 YO GF Players	1897-2000
Weideman	17.6
Leahy	17.6
Clayton	17.6
Payne	17.9
Davis	18
Crosswell	18.1
Walls	18.2
Leehane	18.3
Fletcher	18.4
Eade	18.5
Kenneally	18.5
Bennett	18.6
Carter	18.6
Breen	18.7
Misiti	18.9
Fanning	18.9
Hynes	18.9
Russo	18.9
Hands	18.9
Oppy	18.9

1 in a 100
 chance of 17-
 19 year old
 playing in a
 winning grand
 final team in
 AFL/ VFL
 history

RESULT OF “YOUNG” LISTS

Average of Teams Ages Round 1 to Grand Final

Round 1	25
Round 14	24.5
Round 20	24.3
Finals Week 1	24.9
Finals Week 2	25.1
Prelim	25.2
Grand Final	25.2

AFLDILEMMA

- If a club doesn't draft best 17 to 18 yo then they miss out on best talent.
- If optimal age for an athlete is from 23 to 29 then on average it will take 5 or more years to develop players.
- Average Tenure AFL Coach < 3 years vs Ave AFL Dvt for a player of 5 years!
- Recycling 24-28 yo in current system means they might have baggage!