FFBaD
Fédération Française de Badminton

YONEX

BWF

BWF WORLD COACHING CONFERENCE 2025

Paris, France

29 - 30 August 2025

bwf.sport

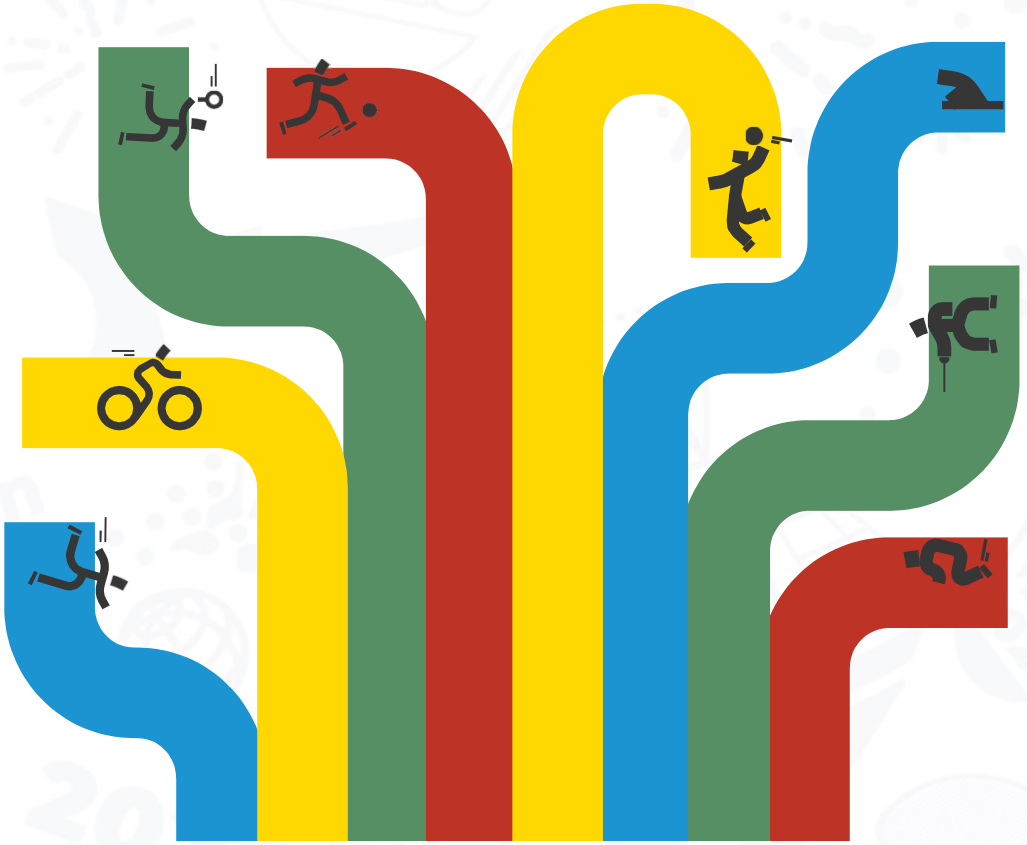
bwf.sport/development

Johan Pion

Sliding Benchmarks for Identification and Biobanding for Development in Badminton

Lode Goossens

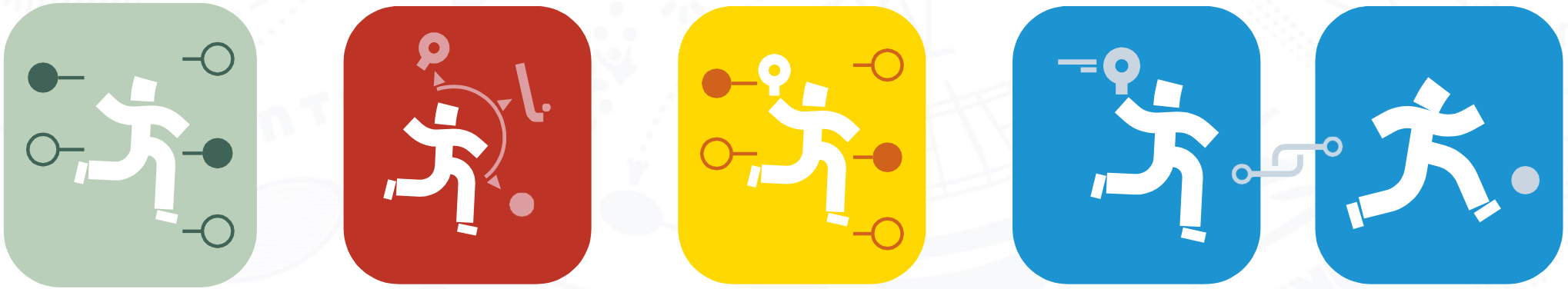
hylyght



Sliding Benchmarks for Identification Biobanding for Development

Johan Pion

Talent assessment



Detection Orientation Identification Talent transfer

Identifying the better athletes

Identification

Archives of Budo, 2018

M.R.W. Norjali Wazir, M. Mostaert, J. Pion, M. Lenoir
Anthropometry, physical performance and motor coordination of medallist and non-medallist young fencers
Archives of Budo, 2018

PlosOne, 2019

M.R.W. Norjali Wazir, M. Van Hiel, M. Mostaert, F Deconinck, J. Pion, M. Lenoir
Identification of elite performance characteristics in a small sample of taekwondo athletes
PlosOne, 2019

Archives of Budo, 2017

M.R.W. Norjali Wazir, M. Torfs, M. Mostaert, J. Pion, M. Lenoir
Predicting judo champions and medallists using statistical modelling
Archives of Budo, 2017

Int. J. Sports Medicine, 2015

J. Pion, M. Lenoir, B. Vandorpe, V. Segers
Talent in female gymnastics a survival analysis based upon performance characteristics
International journal of sports medicine, 2015

J. Sports Science & Medicine, 2015

D. Deprez, M. Bucheit, J. Fransen, J. Pion, M. Lenoir, R. Philippaerts, R. Vaeyens
A longitudinal study investigating the stability of anthropometry and soccer-specific endurance in pubertal high-level youth soccer players
Journal of Sports Science and Medicine, 2015

Journal of Sports Sciences, 2012

S. Matthys, R. Vaeyens, J. Fransen, D. Deprez, J. Pion, J. Vandendriessche, B. Vandorpe, M. Lenoir, R. Philippaerts
A longitudinal study of multidimensional performance characteristics related to physical capacities in youth handball
Journal of Sports Sciences, 2012

J. Strength & Conditioning R., 2015

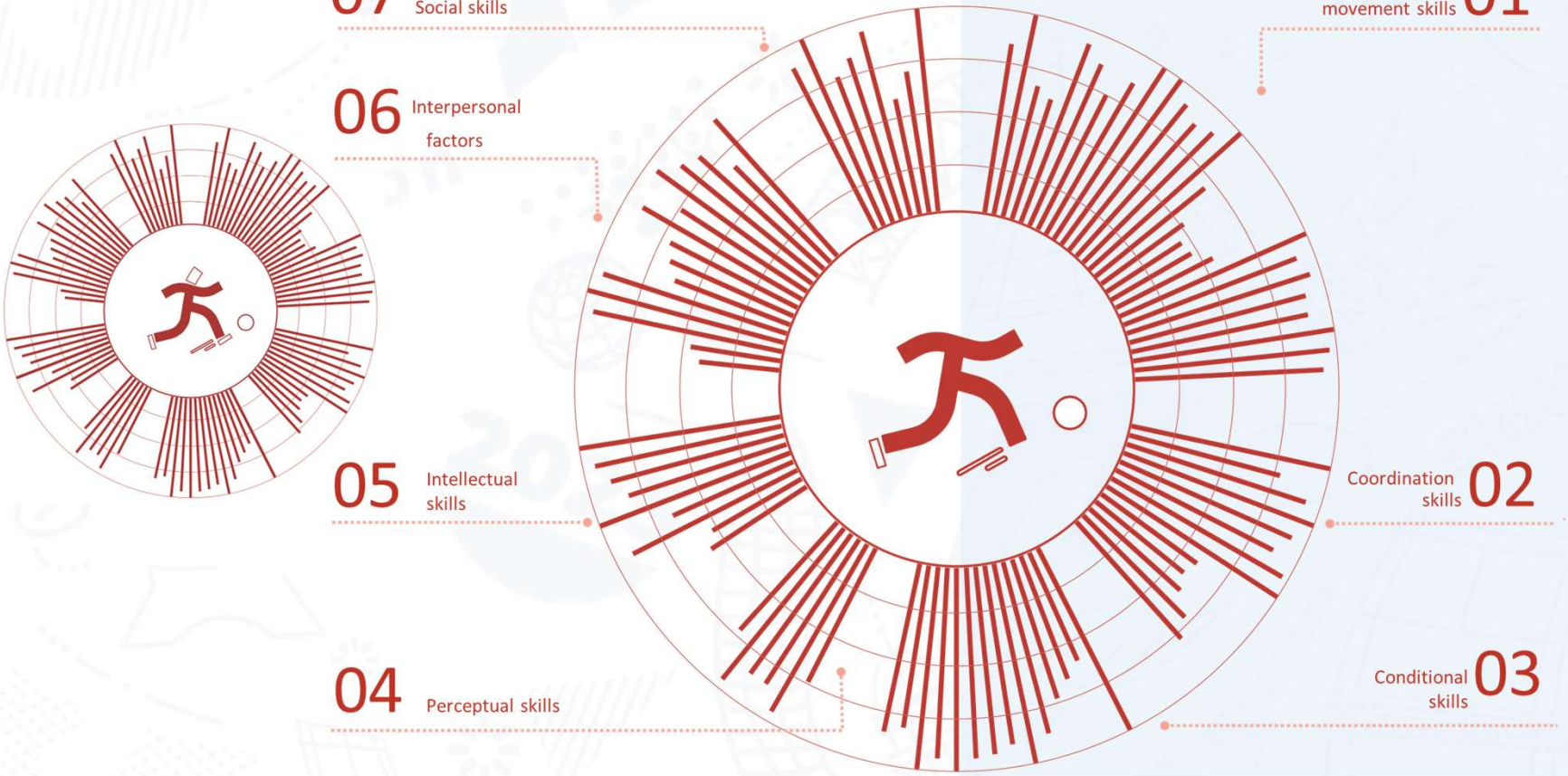
J. Pion, J. Fransen, D. Deprez, V. Segers, R. Vaeyens, R. Philippaerts, M. Lenoir,
Stature and jumping height are required in female volleyball, but motor coordination is a key factor for future elite succes
Journal of Strength and Conditioning Research, 2015

Int. J. Sport Sci. & Coaching, 2018

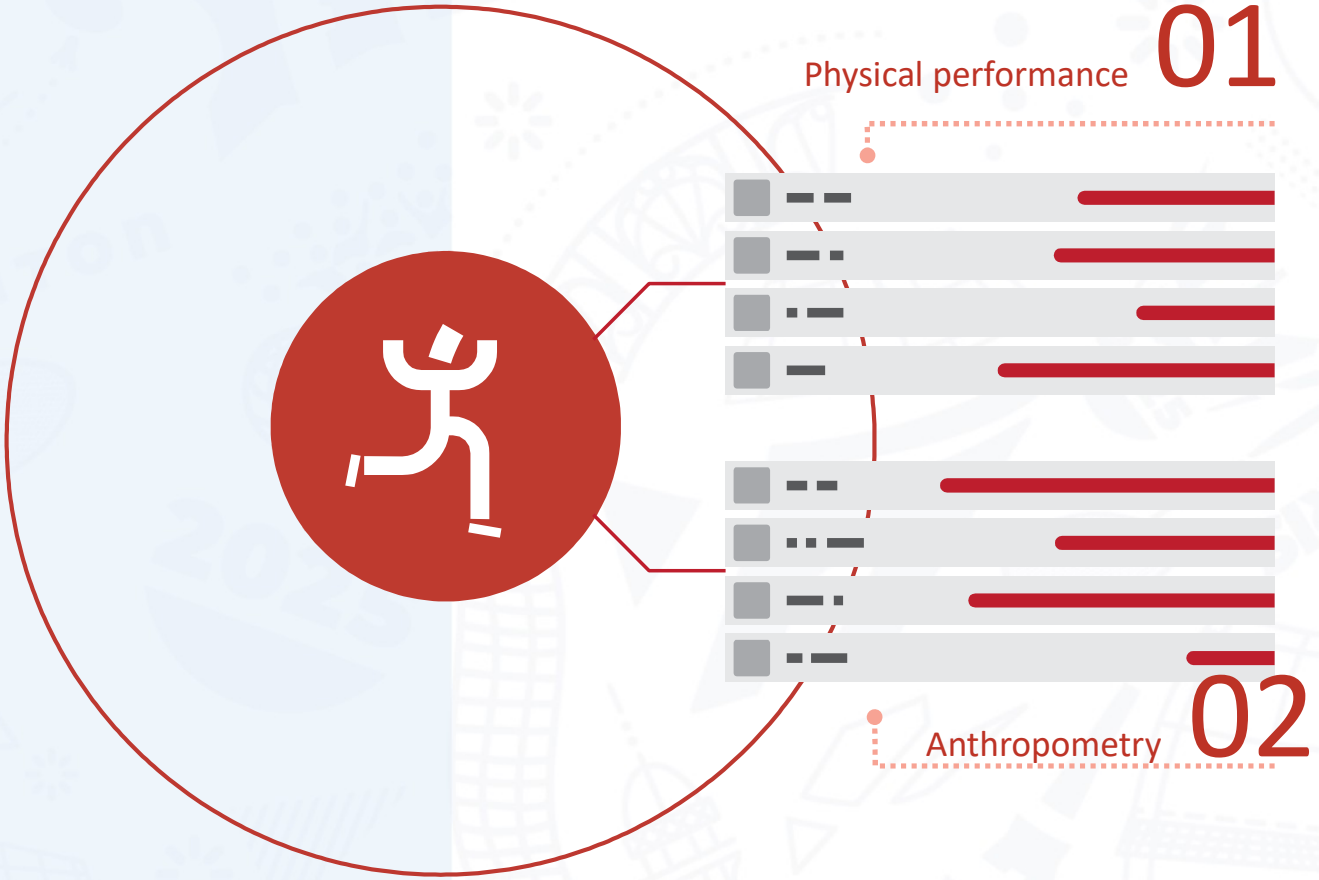
J. Pion, V. Segers, J. Stautemas, J. Boone, M. Lenoir, J. Bourgois
Position-specific performance profiles, using predicitive classification models in senior basketball
International Journal of Sports Science and Coaching, 2018

Sport profiles

HAN / UGent / IAT

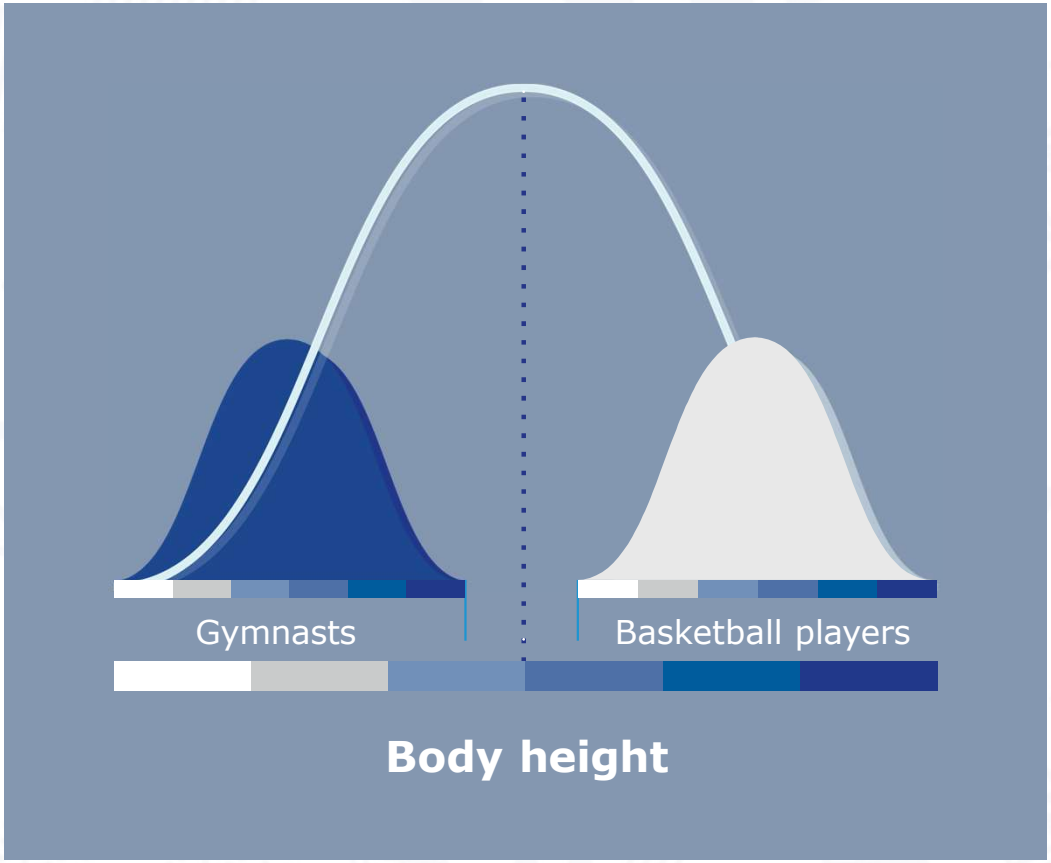


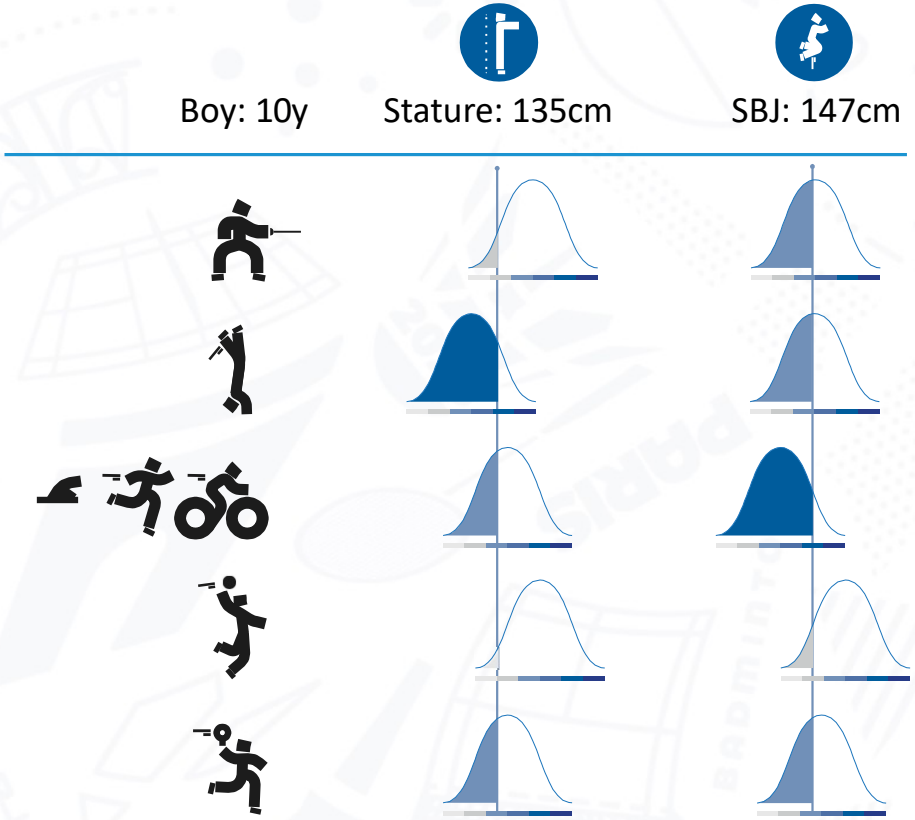
Athlete profiles



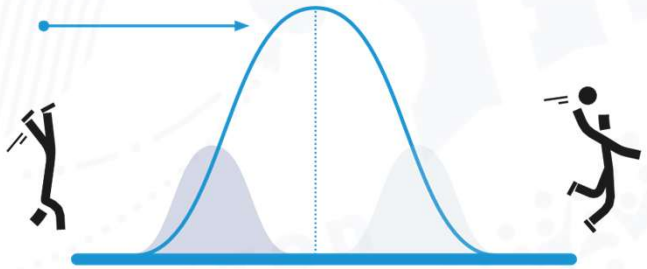
A data driven ecosystem

Generic and sport specific benchmarks

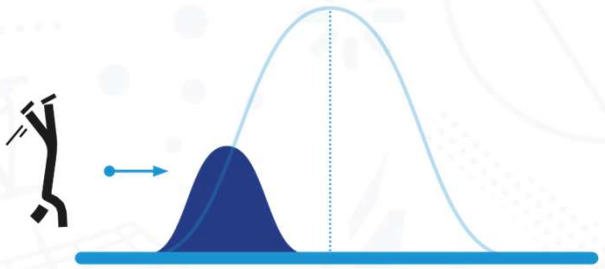




Benchmarks

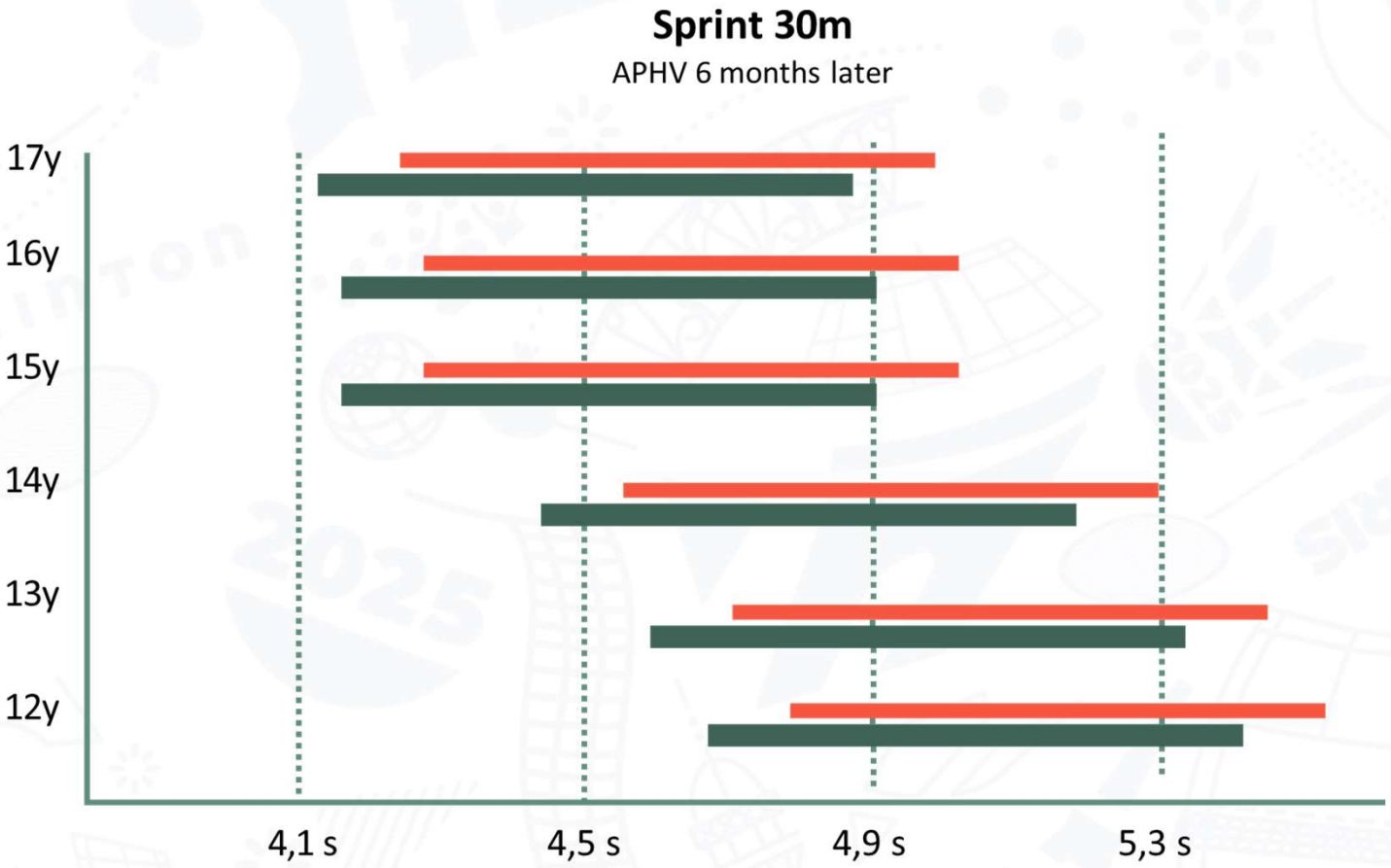


Stature girls	Z = -1 AQ = **85**	Z = -0.5 AQ = **92.5**	Z = 0 AQ = **100**	Z = +0.5 AQ = **107.5**	Z = +1 AQ = **115**
6y	**110**	**115**	**120**	**125**	**130**
7y	**120**	**123**	**126**	**129**	**132**
8y	**126**	**129**	**132**	**135**	**138**
9y	**130**	**133**	**137**	**140**	**144**
10y	**134**	**138**	**141**	**145**	**149**
11y	**140**	**144**	**147**	**151**	**155**
12y	**147**	**152**	**157**	**162**	**167**



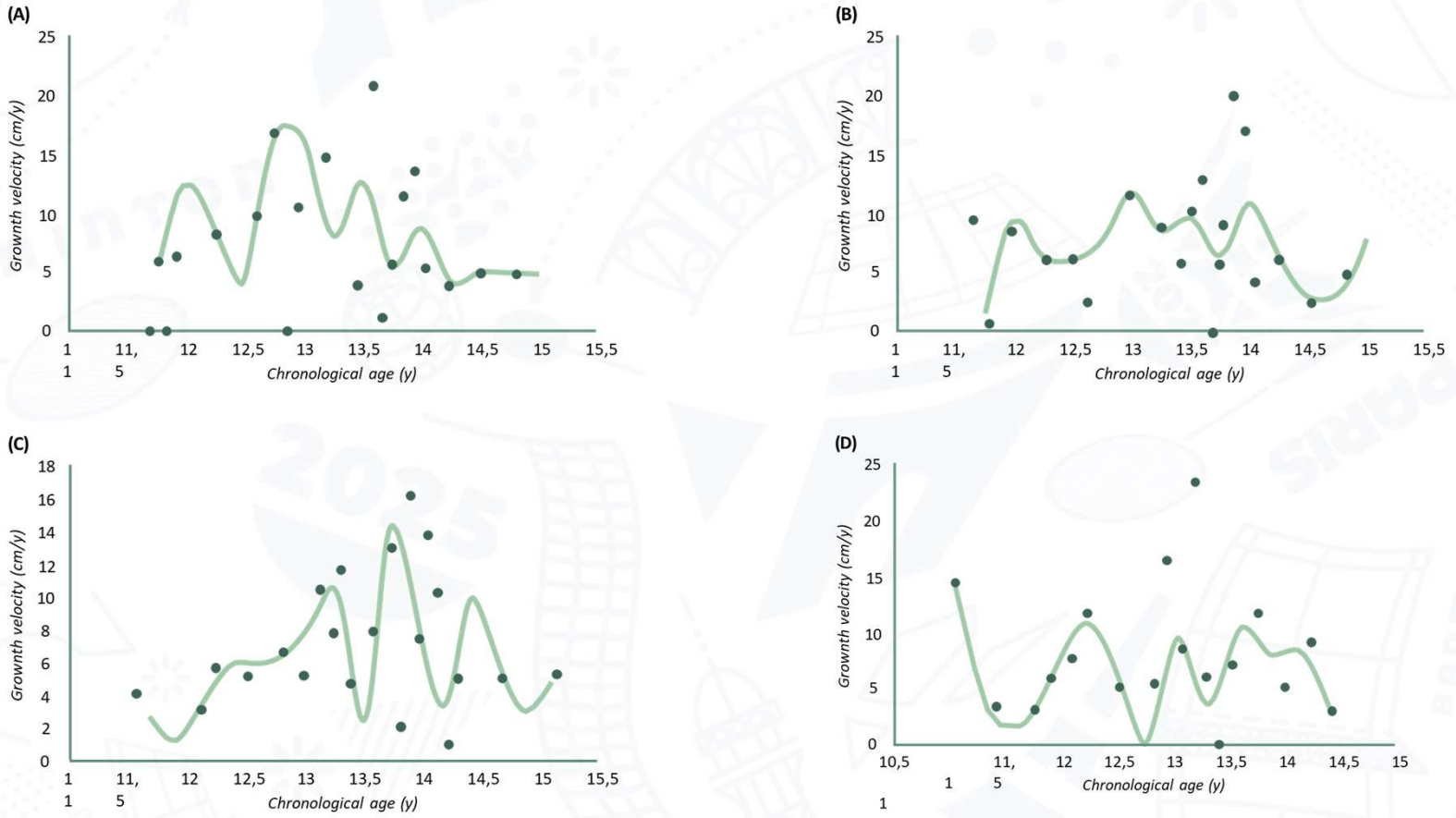
Stature girls	Z = -1 AQ = **85**	Z = -0.5 AQ = **92.5**	Z = 0 AQ = **100**	Z = +0.5 AQ = **107.5**	Z = +1 AQ = **115**
6y	**96**	**100**	**105**	**109**	**113**
7y	**111**	**114**	**116**	**119**	**122**
8y	**117**	**119**	**122**	**125**	**128**

Maturity bias



Maturity bias

Growth velocity of 4 players (Teunissen et al. 2020)



Growth tracker

HAN

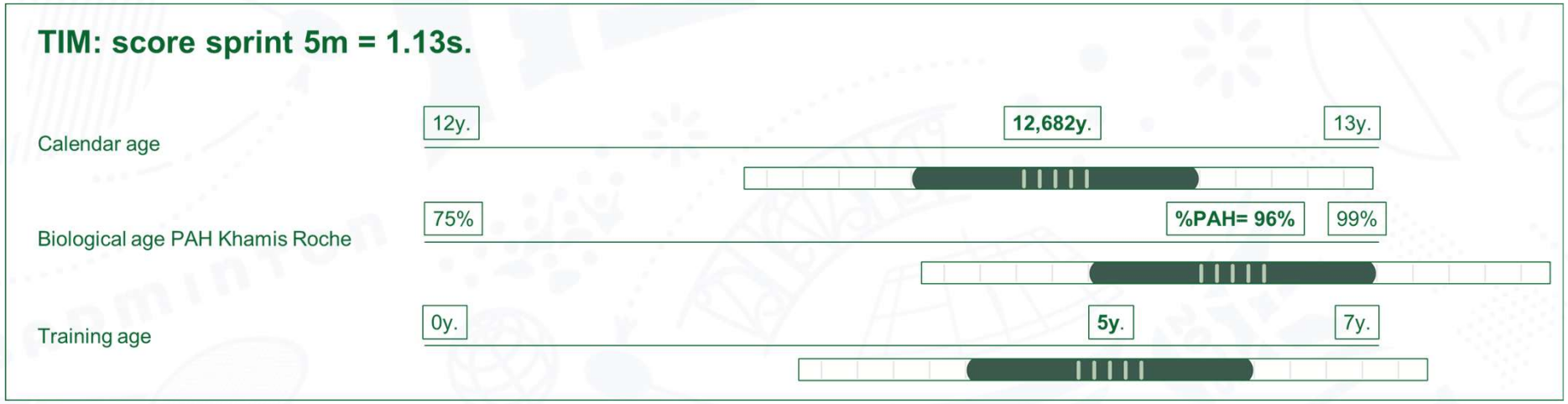
GROWTH TRACKER

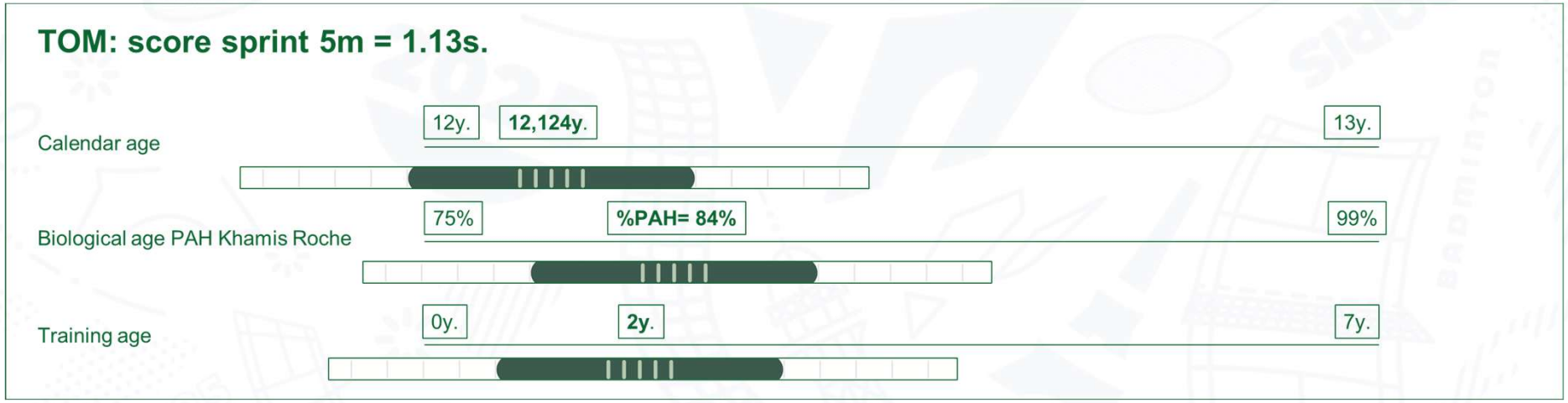
IdPlayer	113	Gender	M		Birthday	22	3	1997	
TestDay	TestMonth	TestYear	Age	Δ Age	Weight	Stature	Δ Stature	Growth/Year	
27	11	2008	11,685		33,0	147,5			
1	12	2008	11,696	,011	33,0	147,5	0	0,000	
19	1	2009	11,83	,134	35,5	148,3	,8	5,970	
20	1	2009	11,833	,003	35,5	148,3	0	0,000	
24	3	2009	12,006	,173	35,5	149,4	1,1	6,358	
25	9	2009	12,512	,506	40,0	153,6	4,2	8,300	
23	11	2009	12,674	,162	41,0	155,2	1,6	9,877	
18	1	2010	12,828	,154	41,9	157,8	2,6	16,883	
15	2	2010	12,904	,076	42,3	157,8	0	0,000	
25	3	2010	13,008	,104	43,7	158,9	1,1	10,577	
5	8	2010	13,373	,365	45,6	164,3	5,4	14,795	
8	10	2010	13,548	,175	48,7	165,0	,7	4,000	
5	11	2010	13,625	,077	51,0	166,6	1,6	20,779	
6	12	2010	13,71	,085	51,9	166,7	,1	1,176	
7	1	2011	13,797	,087	51,7	167,2	,5	5,747	
14	2	2011	13,902	,105	53,4	168,4	1,2	11,429	
18	3	2011	13,989	,087	54,0	169,6	1,2	13,793	
21	4	2011	14,082	,093	55,8	170,1	,5	5,376	
11	8	2011	14,389	,307	56,6	171,3	1,2	3,909	
6	11	2011	14,628	,239	57,1	172,5	1,2	5,021	

PAH =180cm
Khamis -Roche

- % PAH <85
- % PAH >85
- % PAH >89
- % PAH >95

Interpretation of a performance





Badminton Study

Sport profile badminton

Journal of Sports Sciences

ISSN: 0264-0414 (Print) 1466-447X (Online) Journal homepage: http://www.tandfonline.com/loi/rjsp20

A coaches' perspective on the contribution of anthropometry, physical performance, and motor coordination in racquet sports

Kamasha Robertson, Johan Pion, Mireille Mostaert, Mohd Rozilee Wazir Norjali Wazir, Tamara Kramer, Irene Renate Faber, Pieter Vansteenkiste & Matthieu Lenoir

Performance characteristics Badminton (n= 97 surveys)

Test battery for badminton connected to the SportKompas ecosystem

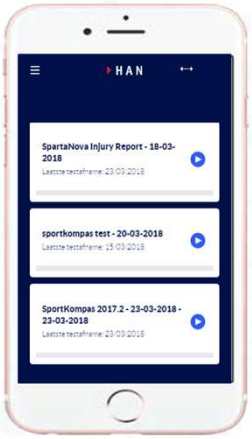
Journal of Sports Sciences

ISSN: 0264-0414 (Print) 1466-447X (Online) Journal homepage: http://www.tandfonline.com/loi/rjsp20

A coaches' perspective on the contribution of anthropometry, physical performance, and motor coordination in racquet sports

Kamasha Robertson, Johan Pion, Mireille Mostaert, Mohd Rozilee Wazir Norjali Wazir, Tamara Kramer, Irene Renate Faber, Pieter Vansteenkiste & Matthieu Lenoir

9.5	9.2	8.9	8.9	8.4
Agility	Speed	Hitting	Jumping	Balance



Agility (3)

10x 5m shuttle sprint
Jumping sideways (KTK)
Moving sideways (KTK)

Speed (1)

Sprint 5m

0bject control (1)

Faber
eye – hand
coordination

Jumping (2)

Standing broad jump
Counter movement jump

Balance (1)

Balancing backwards
(KTK)

Results for physical performance

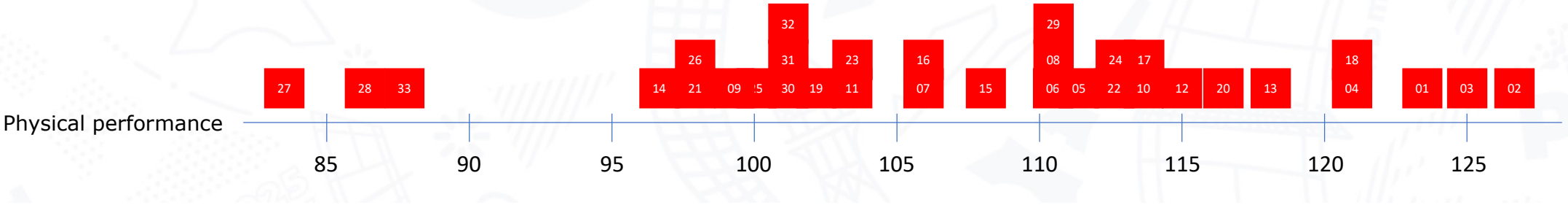
Field test	Age group 12y old boys (n= 33)
Sit and reach (cm)	32 ± 6
Sprint 5m (s)	1.191 ± .079
Sprint 30m (s)	5.019 ± .291
Shuttle run 10x5m (s)	19.063 ± .1.020
Counter movement jump (cm)	43.1 ± 6.8
Standing broad jump (cm)	180 ± 23
Curl ups (N/30s)	33 ± 9
Plate tapping (s)	12.2 ± 2.4
Endurance shuttle run (min)	9 ± 2

Already Selected in 2017

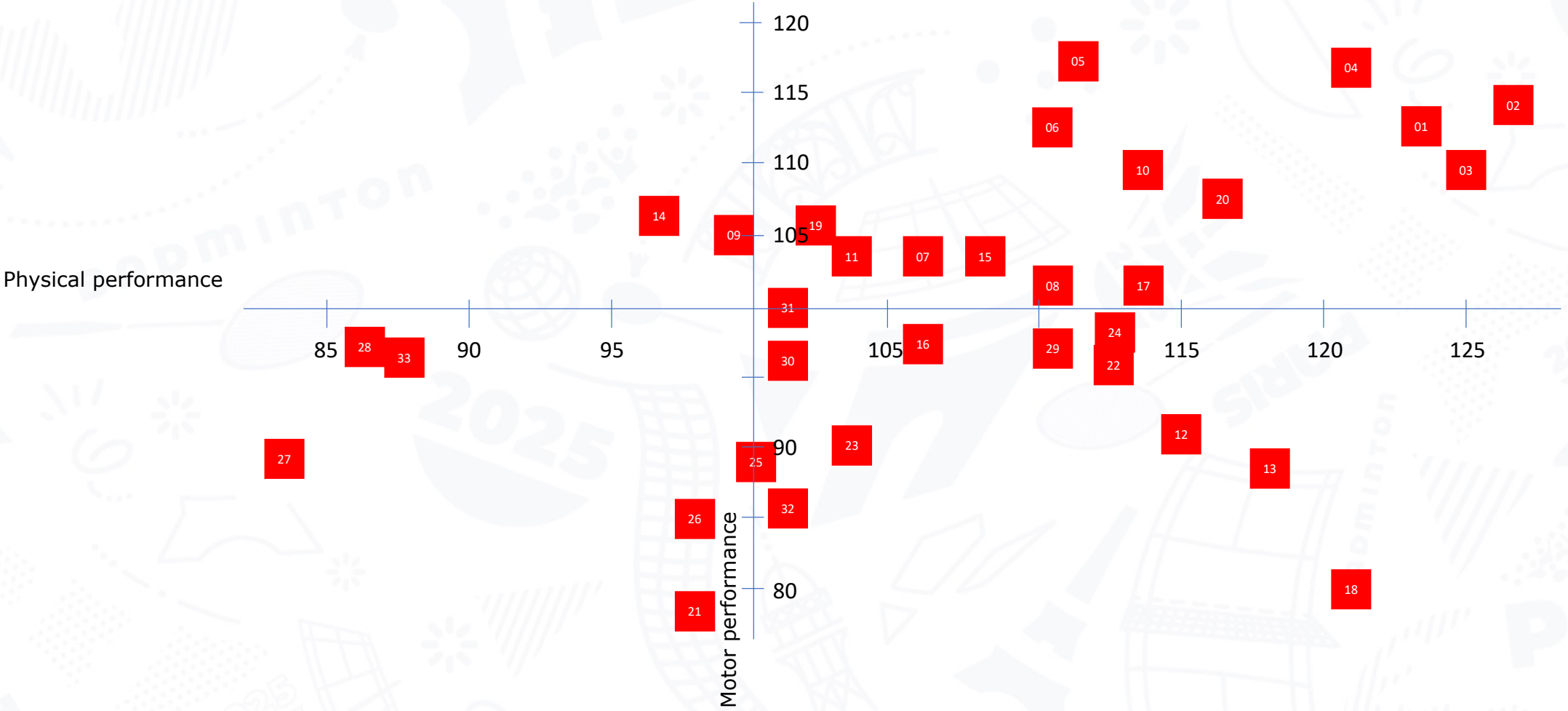
Players : 1 - 2 - 3 - 4 - 5 – 6

New Selection (2018)
based on Physical performance

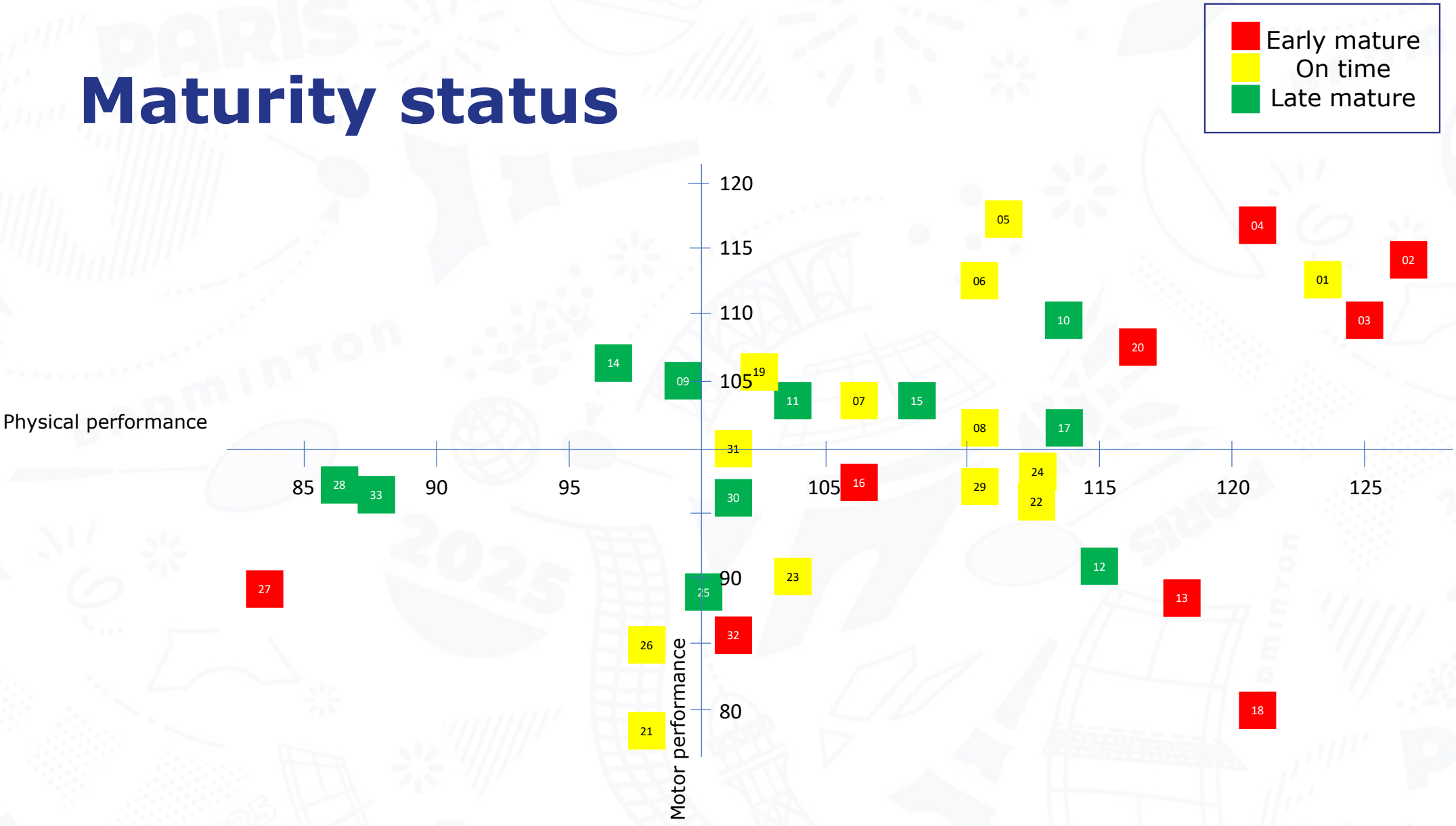
Players : 18 - 13 - 20 - 12 - 10 – 17



Results for physical performance and motor competence



Maturity status



Identifying and selecting talent in sport

High potential but current underperformer 5	High potential meets performance standards 2	Obvious talent with above average performance 1
Average potential but current underperformer 7	Average potential with average performance 4	Exceeds standards but has average potential 3
Low potential under-performer 9	Meets performance standards but not much potential 8	Exceeds standards but is likely performing above potential 6

Baker, J., Schorer, J., & Wattie, N. (2018)

Benchmarks for anthropometry

Benchmark	RAE disadvantage age < 12.2(n=10)	Maturity disadvantage PAH < 85 (n=11)	age group 12y old boys (n= 33)	RAE advantage age > 12.6 (n=7)	Maturity advantage PAH > 89 (n= 9)
Height (cm)	146.5 + 5.3 **3% smaller**	144.2 + 5.2 **5% smaller**	151.8 + 9.3	155.1 + 15.0 **2% taller**	163.2 ± 7.6 **8% taller**
Weight (kg)	40.0 + 6.6 **8% lighter**	37.3 + 4.8 **14% lighter**	43.6 + 8.0	45.1 + 10.0 **3% heavier**	54.0 + 5.1 **24% heavier**
Sitting Height (cm)	76.2 + 2.9 **3% smaller**	75.0 + 2.4 **5% smaller**	78.8 + 5.2	80.2 + 7.6 **2% taller**	85.4 + 4.8 **8% taller**

Benchmarks for physical performance

Benchmark	RAE disadvantage	Maturity disadvantage	age group 12y old boys (n= 33)	RAE advantage	Maturity advantage
	age < 12.2(n=10)	PAH < 85 (n=11)		age > 12.6 (n=7)	PAH > 89 (n= 9)
Sit and reach (cm)	31 ± 7 disadvantage 3%	31 ± 5 disadvantage 3%	32 ± 6	33 ± 4 advantage 3%	35 ± 6 advantage 9%
Sprint 5m (s)*	1.213 ± .060 disadvantage 2%	1.221 ± .061 disadvantage 3%	1.191 ± .079	1.221 ± .090 disadvantage 2%	1.149 ± .074 advantage 3%
Sprint 30m (s)*	5.117 ± .223 disadvantage 0.2%	5.131 ± .240 disadvantage 2%	5.019 ± .291	4.914 ± .350 advantage 3%	4.863 ± .355 advantage 3%
Shuttle run 10x5m (s)*	19.320 ± .0.685 disadvantage 1%	19.195 ± .0.725 disadvantage 0.6%	19.063 ± .1.020	18.636 ± .1.156 disadvantage 0.6%	18.607 ± .1.260 advantage 2%
Counter movement jump (cm)*	39.5 ± 5.4 disadvantage 8%	40.2 ± 4.5 disadvantage 7%	43.1 ± 6.8	46.2 ± 5.4 advantage 7%	47.0 ± 9.0 advantage 9%
Standing broad jump (cm)*	169 ± 17 disadvantage 6%	168 ± 14 disadvantage 6%	180 ± 23	200 ± 20 advantage 11%	197 ± 29 advantage 9%
Curl ups (N/30s)	36 ± 8 advantage 9%	33 ± 9 status quo	33 ± 9	38 ± 9 advantage 12%	33 ± 7 status quo
Plate tapping (s)	12.8 ± 2.1 disadvantage 5%	12.1 ± 2.5 advantage 0.6%	12.2 ± 2.4	9.5 ± 0.3 advantage 22%	11.4 ± 2.1 advantage 7%
Endurance shuttle run (min)	9 ± 2 status quo	9 ± 1 status quo	9 ± 2	9 ± 2 status quo	9 ± 2 status quo
Overall physical performance	**disadvantage 1.8%**	**disadvantage 2.5%**		**advantage 7.1%**	**advantage 4.7%**

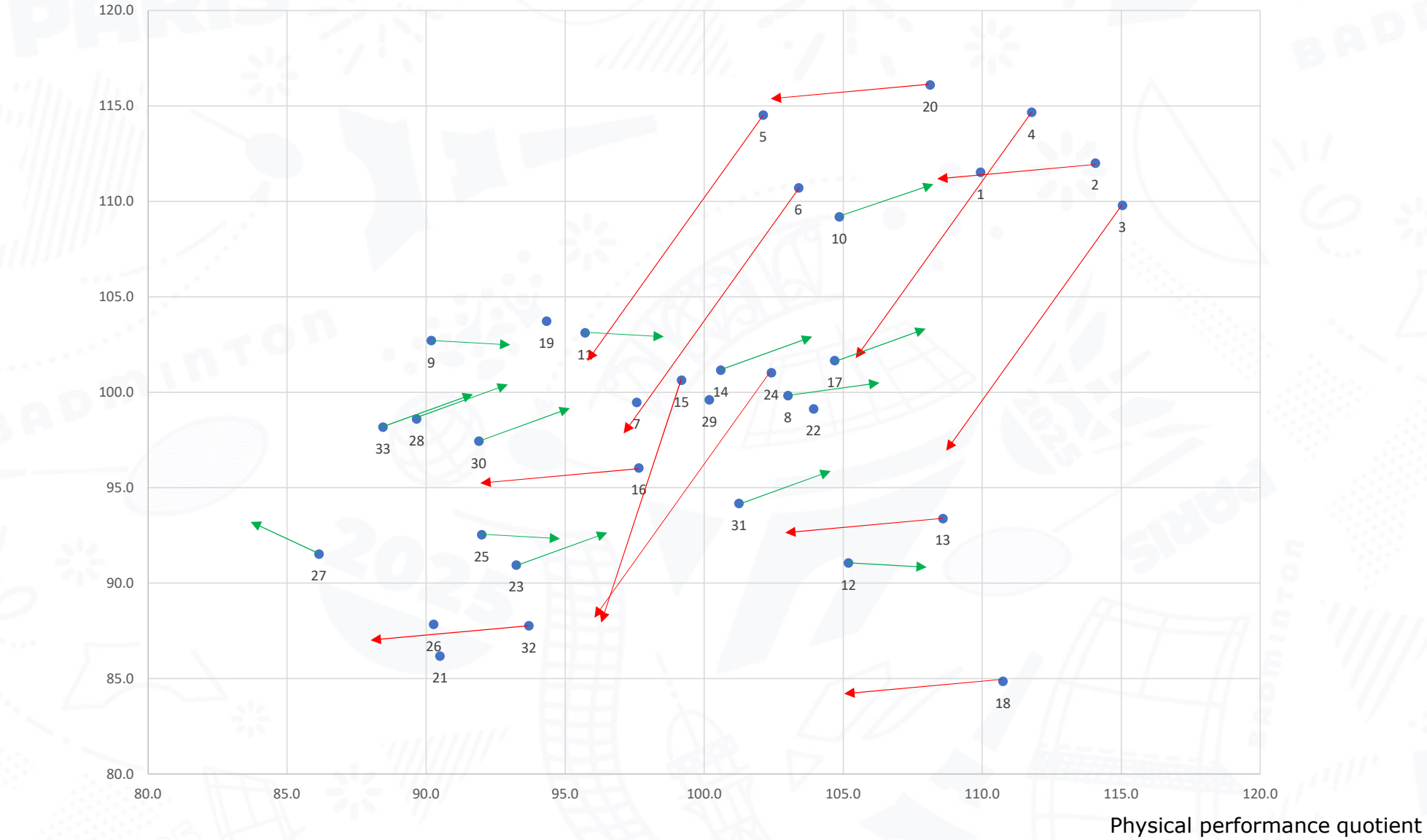
Results for motor performance

Benchmark	RAE disadvantage	Maturity disadvantage	age group 12y old boys (n= 33)	RAE advantage	Maturity advantage
	age < 12.2(n=10)	**PAH < 85 (n=11)**		**age > 12.6 (n=7)**	**PAH > 89 (n= 9)**
Balance beam KTK	58 ± 8 advantage 4%	59 ± 8 advantage 5%	56 ± 9	62 ± 10 advantage 11%	57 ± 12 advantage 2%
Jumping sideways KTK	94 ± 20 advantage 4%	91 ± 13 advantage 3%	88 ± 18	97 ± 9 advantage 10%	86 ± 20 disadvantage 2%
Moving sideways KTK	34 ± 6 disadvantage 10%	35 ± 3 disadvantage 8%	38 ± 12	49 ± 16 advantage 28%	38 ± 18 status quo
Eye-hand coordination (Faber)	49 ± 8 disadvantage 7%	52 ± 8 disadvantage 2%	53 ± 11	62 ± 5 advantage 17%	51 ± 11 disadvantage 2%
Throwing shuttles	36 ± 2 disadvantage 3%	37 ± 2 status quo	37 ± 2	40 ± 5 advantage 8%	38 ± 3 advantage 3%
Overall motor performance	**disadvantage 2.4%**	**disadvantage 0.4%**		**advantage 14.8%**	**advantage 0.1%**

Sliding Benchmarks

RAE advantage /disadvantage
Maturity advantage / disadvantage

Pion et al. (2025)


Motor performance quotient
120.0
115.0
110.0
105.0
100.0
95.0
90.0
85.0
80.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
Physical performance quotient
20
5
4
2
1
6
10
3
19
11
9
14
15
29
24
17
8
22
7
33
28
30
16
31
13
25
27
23
12
26
32
21
18

Talent selection

Already selected in 2017

Players : 1 - 2 - 3 - 4 - 5 – 6

OLD Selection procedure (2018) based on physical performance

Players : 18 - 13 - 20 - 12 - 10 – 17

NEW selection based on sliding benchmarks

Players : 10 - 14 - 9 - 11 - 19 – 17

Sliding benchmarks:
theoretical concept – evidence based

World Juniors Champion in 2024 drafted in 2018

Cohort 2018
(9 elite players / 24 dropped out)

Talent Development

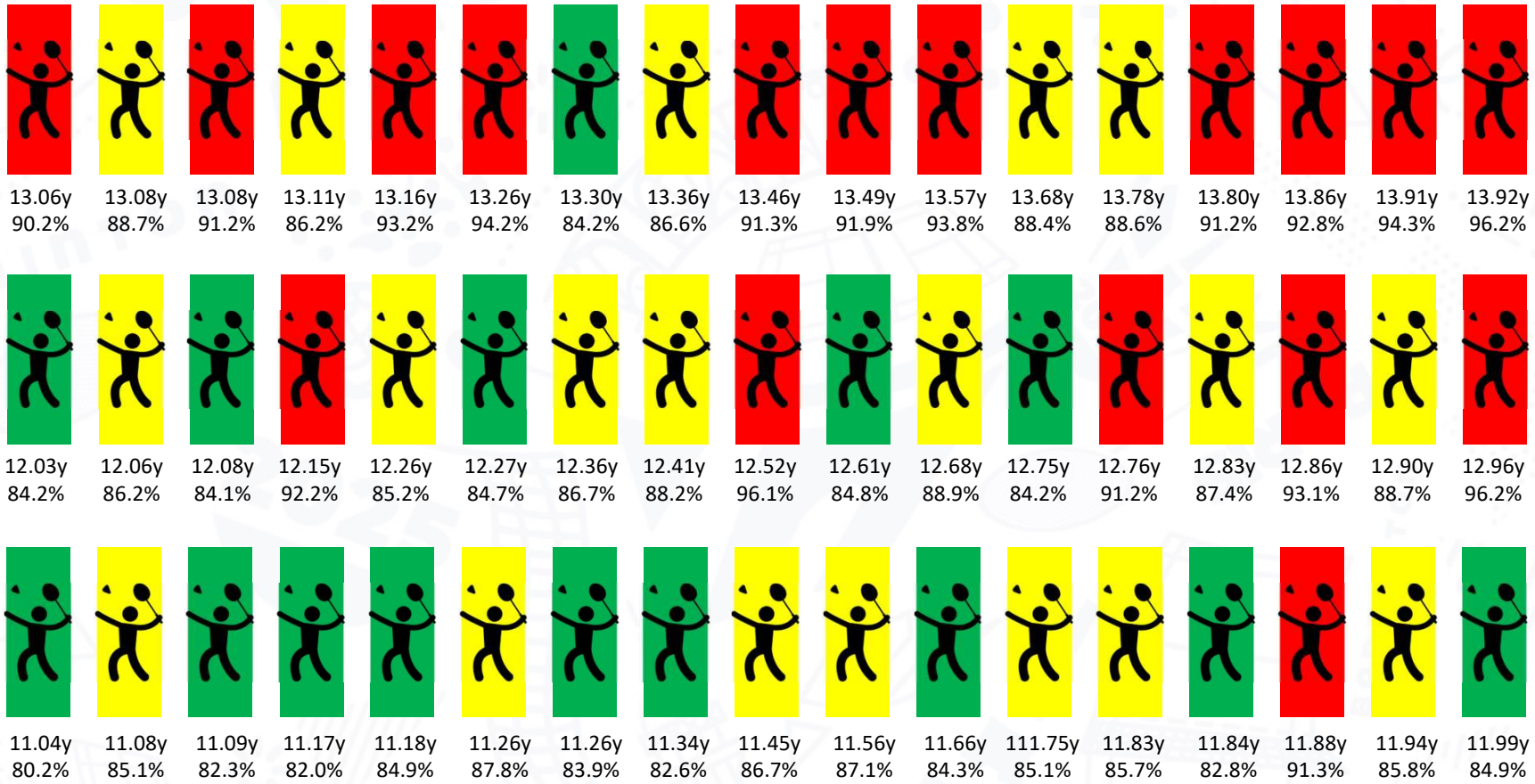
Bio-banding
Development in a biological age-group

Bio-banding sees players grouped together on the basis of their physiological development, rather than their chronological age

Prof. Dr. Sean Cumming

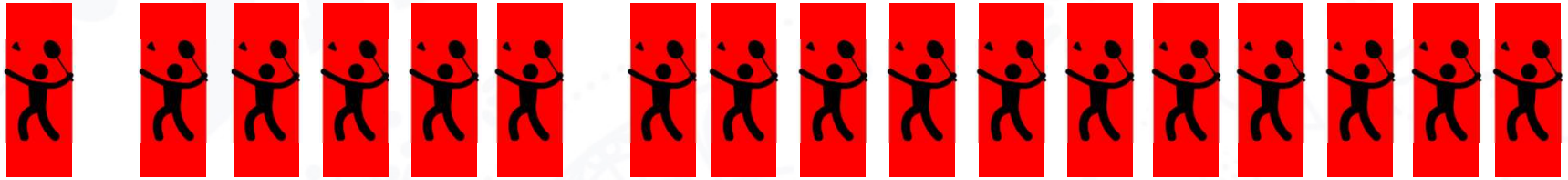
Player 07 Player 17 Player 08 Player 01 Player 24 Player 20

Bio-banding


U 14
13.06y 90.2%
13.08y 88.7%
13.08y 91.2%
13.11y 86.2%
13.16y 93.2%
13.26y 94.2%
13.30y 84.2%
13.36y 86.6%
13.46y 91.3%
13.49y 91.9%
13.57y 93.8%
13.68y 88.4%
13.78y 88.6%
13.80y 91.2%
13.86y 92.8%
13.91y 94.3%
13.92y 96.2%
U 13
12.03y 84.2%
12.06y 86.2%
12.08y 84.1%
12.15y 92.2%
12.26y 85.2%
12.27y 84.7%
12.36y 86.7%
12.41y 88.2%
12.52y 96.1%
12.61y 84.8%
12.68y 88.9%
12.75y 84.2%
12.76y 91.2%
12.83y 87.4%
12.86y 93.1%
12.90y 88.7%
12.96y 96.2%
U 12
11.04y 80.2%
11.08y 85.1%
11.09y 82.3%
11.17y 82.0%
11.18y 84.9%
11.26y 87.8%
11.26y 83.9%
11.34y 82.6%
11.45y 86.7%
11.56y 87.1%
11.66y 84.3%
111.75y 85.1%
11.83y 85.7%
11.84y 82.8%
11.88y 91.3%
11.94y 85.8%
11.99y 84.9%

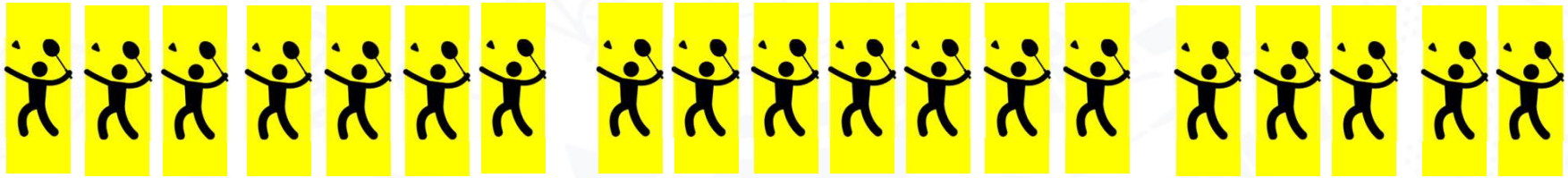
Bio-banding

PAH >89
Second growth spurt



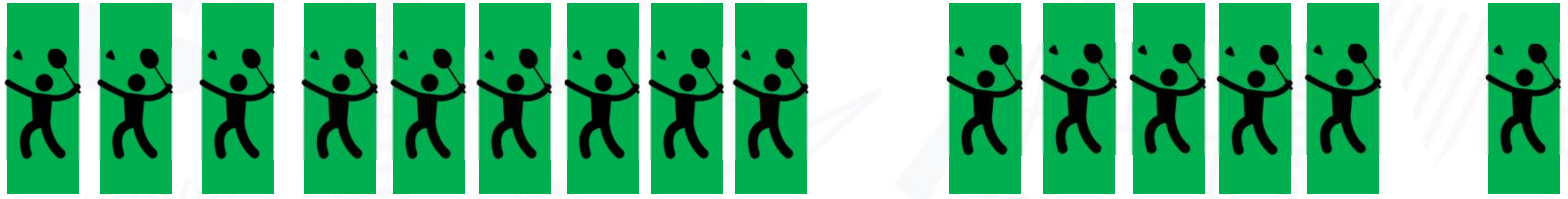
11.88y 91.3% | 12.15y 92.2% | 12.52y 96.1% | 12.76y 91.2% | 12.86y 93.1% | 12.96y 96.2% | 13.06y 90.2% | 13.08y 91.2% | 13.16y 93.2% | 13.26y 94.2% | 13.46y 91.3% | 13.49y 91.9% | 13.57y 93.8% | 13.80y 91.2% | 13.86y 92.8% | 13.91y 94.3% | 13.92y 96.2%

<89 PAH >85
First growth spurt



11.08y 85.1% | 11.26y 87.8% | 11.45y 86.7% | 11.56y 87.1% | 111.75y 85.1% | 11.83y 85.7% | 11.94y 85.8% | 12.06y 86.2% | 12.26y 85.2% | 12.36y 86.7% | 12.41y 88.2% | 12.68y 88.9% | 12.83y 87.4% | 12.90y 88.7% | 13.08y 88.7% | 13.11y 86.2% | 13.36y 86.6% | 13.68y 88.4% | 13.78y 88.6%

PAH <85
Before growth spurt



11.04y 80.2% | 11.09y 82.3% | 11.17y 82.0% | 11.18y 84.9% | 11.26y 83.9% | 11.34y 82.6% | 11.66y 84.3% | 11.84y 82.8% | 11.99y 84.9% | 12.03y 84.2% | 12.08y 84.1% | 12.27y 84.7% | 12.61y 84.8% | 12.75y 84.2% | 13.30y 84.2%

Bio-banding

Development in a biological age-group

Player 07 Player 17 Player 08 Player 01 Player 24 Player 20

A one-fits-all development pathway will cause

Demotivation
Injuries
Dropout

Bio-banding

Selection and Development (early mature players)

89% - 95% of predicted adult stature.
High risks for injuries during growth spurt.
Reduce load to facilitate structural changes

Player 07

12,56y and PAH = 90,3% (Second growth spurt)
Agile (reduce load)
Slow but agile (too much sprints can cause injuries)
Good jumping performances (reduce load)
Core Stability (train)
Average endurance (action needed)

Player 20

12,65y and PAH = 92,6% (Second growth spurt)
Slow but agile (too much sprints can cause injuries)
Average jumping performances (too much jumps can cause injuries)
Average Core Stability (action needed)
Good endurance (train)

Forecast: Both players have to reduce the training load and will improve slower than their later mature peers risk for demotivation

Bio-banding

Selection and Development

85% - 89% of predicted adult stature.
Risks for injuries during first growth spurt.
Focus on neural adaptations and motor learning

Player 08

12,93y and PAH = 88,1% (First growth spurt)
Agile (reduce load - train neural velocity)
Average jumping performances (reduce load)
Core Stability (train)
Average endurance (action needed)

Player 17

12,35y and PAH = 86,9% (First growth spurt)
Fast and agile (reduce load - train neural velocity)
Good jumping performances (train and reduce load)
Average Core Stability (action needed)
Average endurance (action needed)

Forecast: The younger player 17 will improve faster with less risk for injuries than player 08

Bio-banding

Selection and Development (late mature players)

Under 85% of predicted adult stature.
Low risks for injuries before the growth spurt.
Provide a broad development

Player 01

11,95y and PAH = 81,8% (Late mature)
Average speed and agility (action needed)
Average jumping performances (action needed)
Good core stability (train)
Average endurance (action needed)

Player 24

12,06y and PAH = 83,7% (Close to first growth spurt)
Average speed and agility (action needed)
Average jumping performances (action needed)
Average Core Stability (action needed)
Average endurance (action needed)

Forecast: Both players are more resiliant to training than their earlier mature peers

Practical take home message(s)

- Detect the better movers
- Develop the fundamentals
- Benchmark abilities
- Slide benchmarks for relative age
- Slide benchmarks for maturity
- Track and develop your athletes
- Collect data and use electronic devices

Identification and Development Tools for good movers and better athletes


U Ghent
Belgium


UMS
Malaysia


Windesheim
Netherlands


UTS
Canada


U Ghent
Belgium


U Ghent
Belgium


UPM
Malaysia


Hylyght
Belgium