

# YOUTH ATHLETIC DEVELOPMENT

from Science to Practice







## Matias Suhurt



- S&C Coach EWE Baskets BBL
- EWE Baskets Juniors
- Poland, Sweden, Spain, Argentina
- Argentina Youth National Teams



**BSc** High Performance Sports  
**BSc** Physical Education

## Julia Wedman



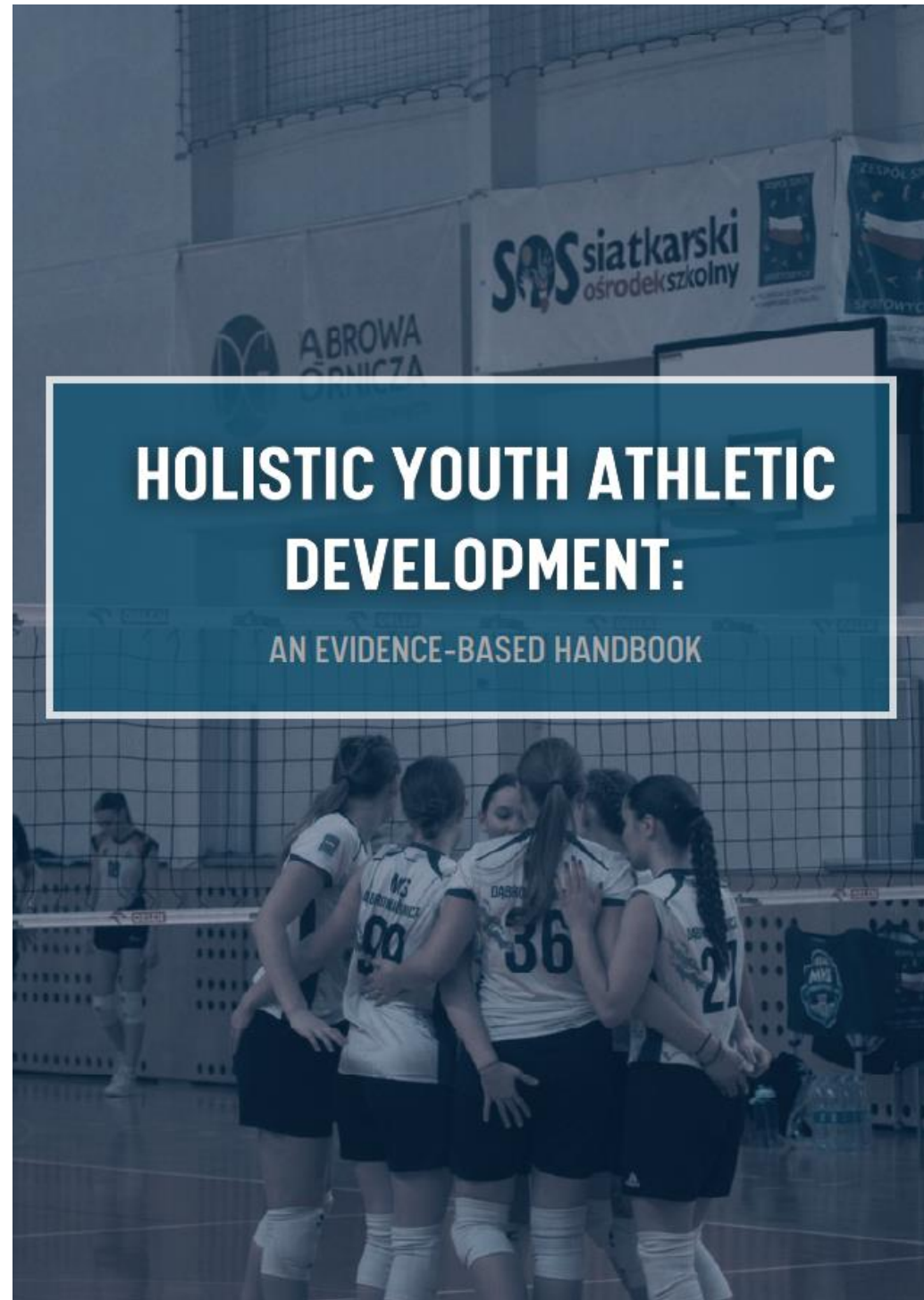
- S&C Coach Sweden National Team (Senior)
- EWE Baskets Juniors
- Ice-hockey, football, Volleyball



**MSc** High Performance Sports (Sport Science)  
**BSc** Exercise Physiology

# PART 1

## the SCIENCE



# PART 2

## the REAL-WORLD







# the **SCIENCE** YOUTH ATHLETIC DEVELOPMENT

**WHAT?**



**WHY?**



**HOW?**



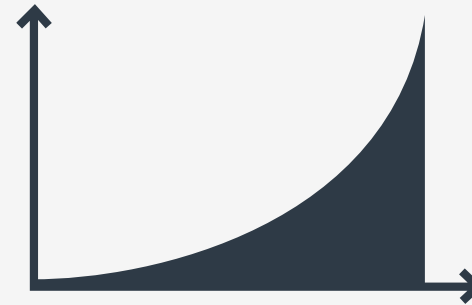
# WHAT IS YOUTH ATHLETIC DEVELOPMENT?



## Athleticism

the ability to perform a wide range of movements with precision and confidence in different environments

- motor skills
- strength
- power
- speed
- agility
- balance
- coordination
- endurance



## Long-term

progressively improve these qualities over time



## Holistic

improve health, fitness, performance, confidence, competence, and reduce injury risk

# WHY IS YOUTH ATHLETIC DEVELOPMENT IMPORTANT?



## Early Specialisation

High volume sport specific training  
from young age

- overuse injuries
- overtraining,
- Burnout
- dropout from sport



## Decreased Levels

Today lower levels of physical  
fitness, motor skill competens,  
strength

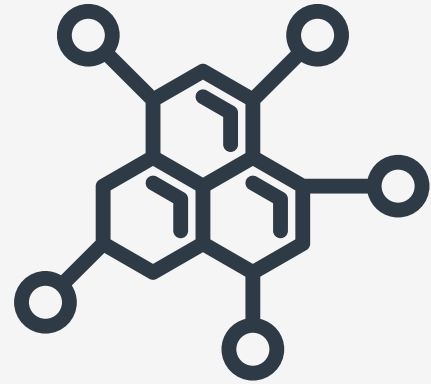
lower tolerance demands of  
sport → Injuries



## Athletic Sucess

Sport alone not enough for  
long-term athletic sucess

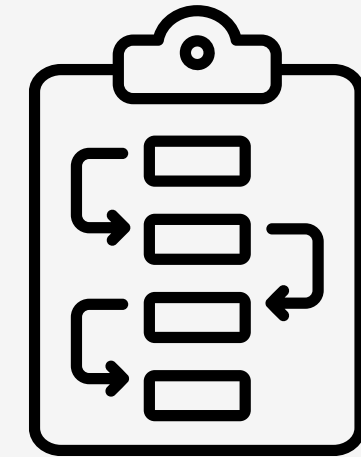
# HOW TO DEVELOP YOUTH ATHLETES?



**GROWTH AND  
MATURATION**

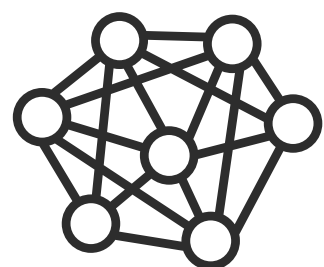


**WHEN TO TRAIN  
WHAT?**



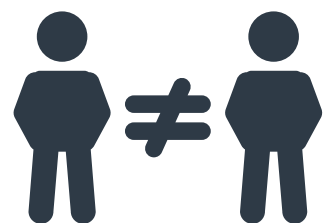
**PLANNING AND  
PROGRAMMING**

# GROWTH & MATURATION



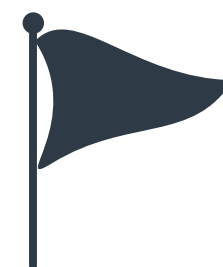
## COMPLEX INTERACTION

growth, maturation, and training.



## YOUTH $\neq$ ADULTS

- lower force production
  - muscle activation patterns
  - aerobic metabolism
  - Recovery high intensity
- performance, recovery, and injury risk.



## PEAK HIGHT VELOCITY



## MAGNITUDE & ADAPTATION

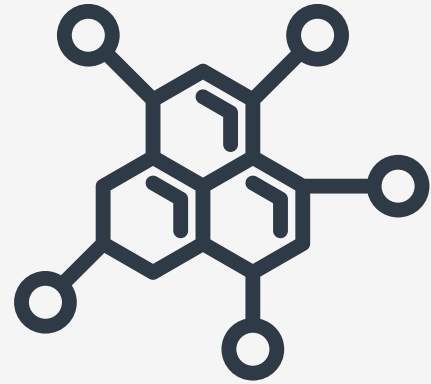
All physical qualities improve during youth, **magnitude** and **type of adaptation** depend on the athlete's maturation stage.

|                   | Early Childhood | Middle Childhood | Adolescence       |          | Adulthood |
|-------------------|-----------------|------------------|-------------------|----------|-----------|
| Female Age        | 2-4             | 5-9              | 10-19             |          | 20 +      |
| Male Age          | 2-4             | 5-11             | 12-20             |          | 21+       |
| Maturation Status | Pre-PHV         |                  | PHV               | Post-PHV |           |
| Growth Rate       | Rapid           | Steady           | Adolescence Spurt | Decline  |           |
| Adaptation        | Neural          |                  | Neural + Hormonal |          |           |

Figure 1. Overview of growth and maturaion process going from childhood to adulthood.



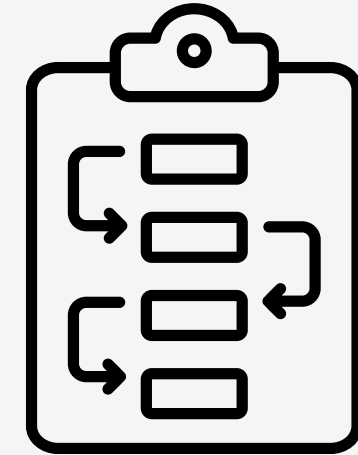
# HOW TO DEVELOP YOUTH ATHLETES?



**GROWTH AND  
MATURATION**



**WHEN TO TRAIN  
WHAT?**



**PLANNING AND  
PROGRAMMING**

# WHEN TO TRAIN WHAT?

1.

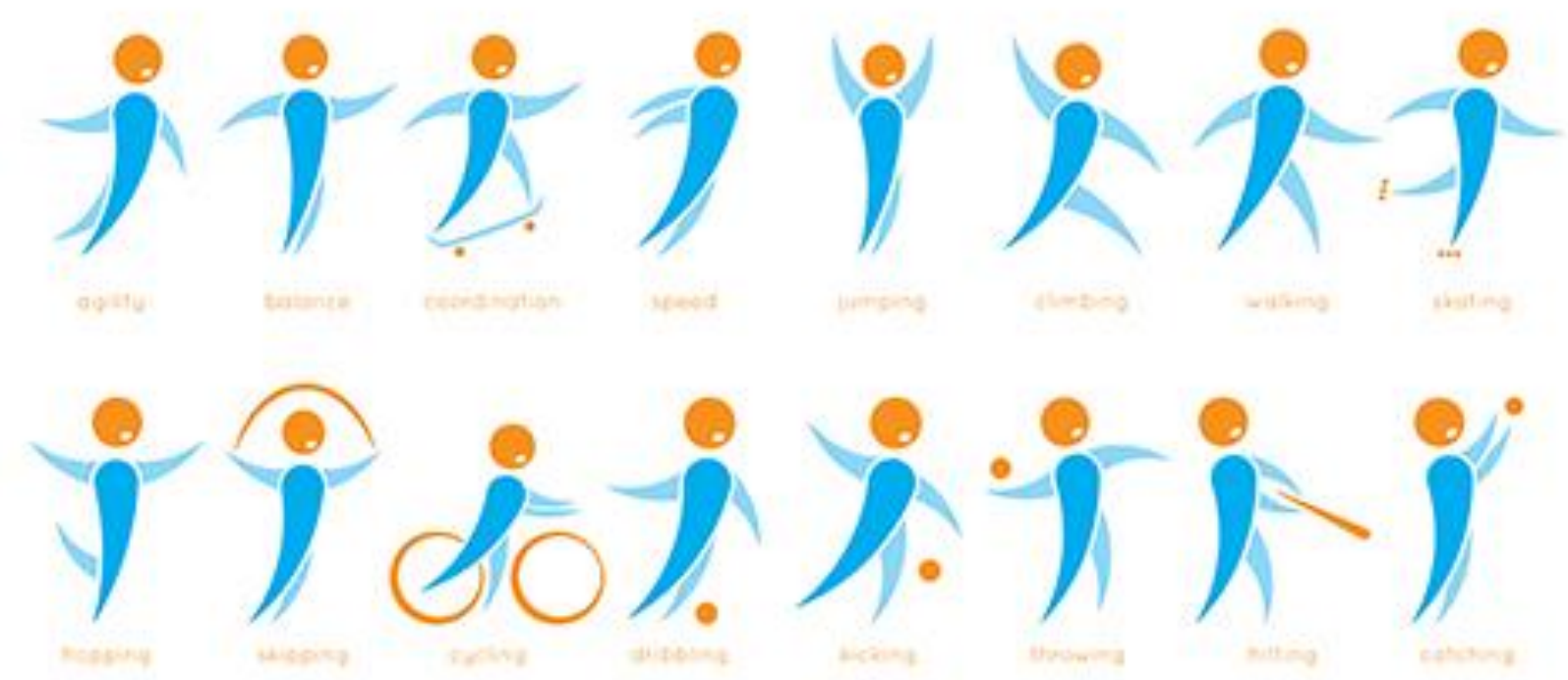
## FUNDAMENTAL MOVEMENT SKILLS

- Prioritized mainly during childhood / pre puberty
- Best developed before PHV due to high neuroplasticity
- Foundation for later sport specific skills

Figure 3. Overview of fundamental movement skills

### FUNDAMENTAL MOVEMENT SKILLS

| LOCOMOTION | MANIPULATION | STABILISATION |
|------------|--------------|---------------|
| Walking    | Catching     | Turning       |
| Running    | Pushing      | Twisting      |
| Bounding   | Pulling      | Bending       |
| Hopping    | Dribbling    | Landing       |
| Leaping    | Throwing     | Extending     |
| Climbing   | Kicking      | Flexing       |
| Skipping   | Carrying     | Hanging       |
| Rolling    | Bouncing     | Bracing       |
| Slipping   | Collecting   | Rotation      |



# WHEN TO TRAIN WHAT?

## 2. STRENGTH

- Trainable at all ages
- Mainly neural adaptations before PHV
- Larger strength gains around and after PHV due to hormonal changes

## 3. POWER

- Can be introduced before PHV in basic forms
- Greater adaptations around and after PHV
- More advanced explosive training post PHV

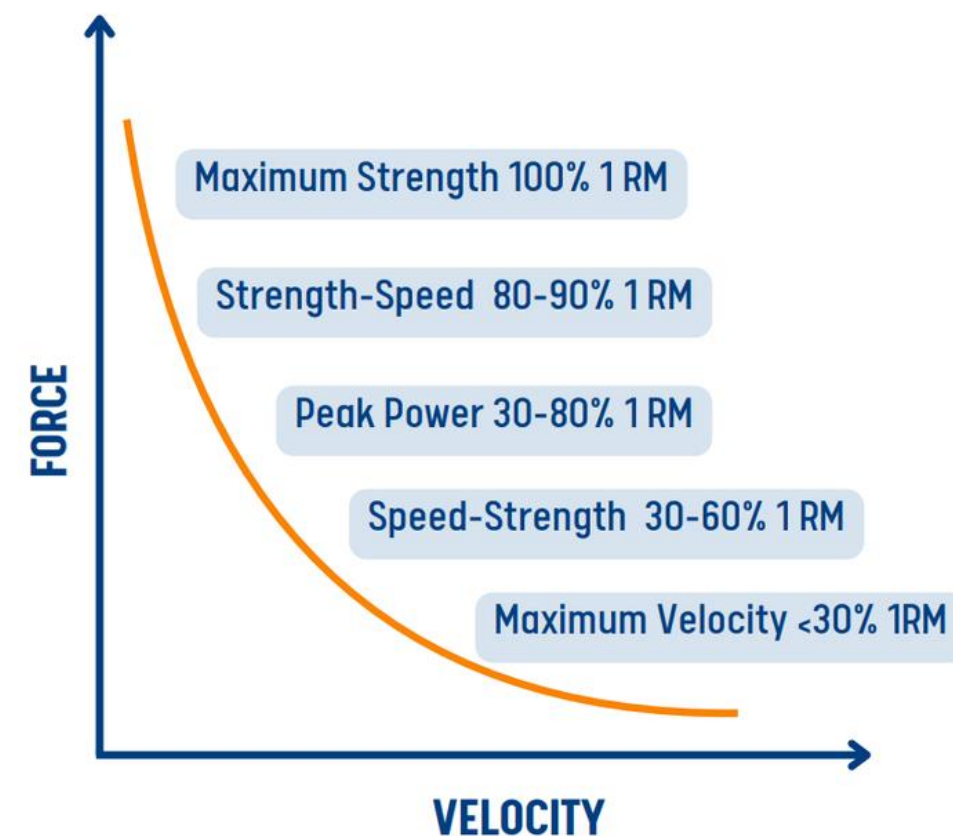
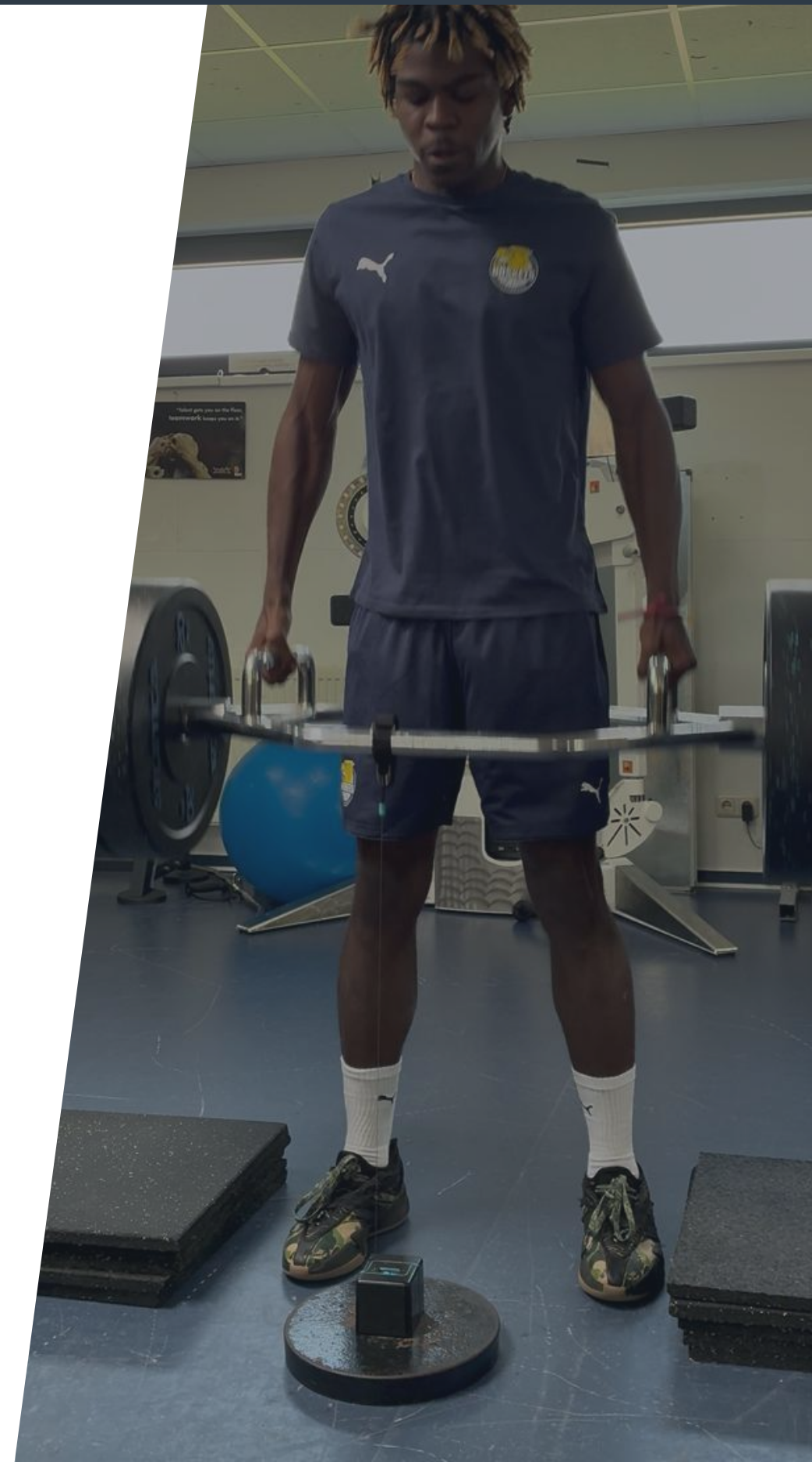


Figure 3. Overview of the force-velocity curve





# WHEN TO TRAIN WHAT?

4.

## SPEED

- Responsive before PHV through neural adaptations
- Can continue improving throughout adolescence
- Often developed through games and sport practice

5.

## AGILITY

- Important throughout development
- Early focus on coordination and movement quality
- More advanced sport specific agility after PHV

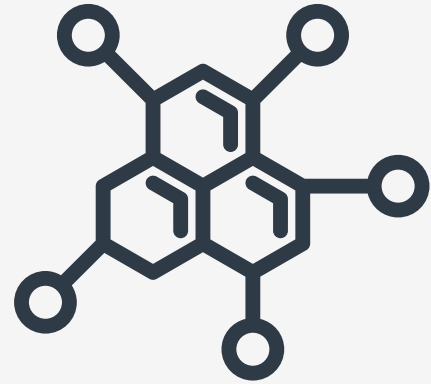
6.

## ENDURANCE

- Trainable before, during, and after puberty
- Usually lower priority until later adolescence/adulthood
- Sport participation often provides enough endurance stimulus in youth



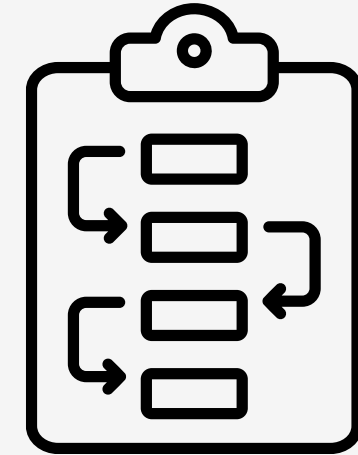
# HOW TO DEVELOP YOUTH ATHLETES?



**GROWTH AND  
MATURATION**



**WHEN TO TRAIN  
WHAT?**



**PLANNING AND  
PROGRAMMING**

# PLANNING & PROGRAMMING

## PRINICPLES OF TRAINING



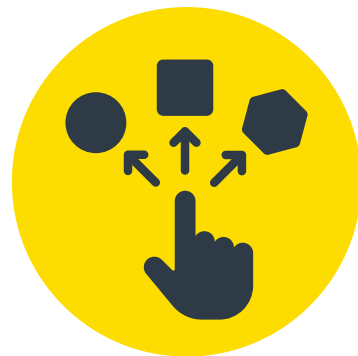
Overload



Specificity



Individuality



Variation



Recovery



Reversability



# PLANNING & PROGRAMMING

## LOAD MANAGEMENT

- Youth athletes need more focus on recovery and fatigue management than adults due to growth and maturation
- Excessive training loads and poor recovery can lead to overtraining, burnout, and injury risk
- Signs of overtraining can be difficult to detect in youth because growth and maturation may mask symptoms

### PHYSIOLOGICAL SIGNS

Loss of appetite  
Predispose of injury  
Frequent tiredness  
Frequent respiratory  
infections  
Heavy muscles  
Sleep problems

### PSYCHOLOGICAL SIGNS:

Lack of interest/emotions  
Feeling intimidated by  
opponents  
Bad mood  
Often feeling sad  
Lack of confidence in  
competition

Figure 5. Physiological and psychological warning-signs of non-functional overreaching and overtraining.

# PLANNING & PROGRAMMING

## **PERIODISATION**

---

- Periodisation = structured and progressive organization of training over time
- Training should match the athlete's growth, maturation, and development stage
- Early stages should prioritize general athletic development and fundamental movement skills
- As athletes mature, training gradually becomes more sport specific and competition focused
- Flexible load management and recovery are essential to optimize performance and reduce overtraining/burnout risk

## **INDIVIDUALISATION**

---

- Sex differences
- Training History
- Maturation status

# PLANNING & PROGRAMMING

## YEARLY STRUCTURE- GENERAL PLAN

|                             | U13-U15             | U15-U17        | U17-U19          |
|-----------------------------|---------------------|----------------|------------------|
| Process Focus               | Learn to Train      | Train to Train | Train to Compete |
| Training Focus              | General Development | Transition     | Sport Specific   |
| Session Structure           | Moderate            | High           | Very High        |
| Session Duration            | 20-40 min           | 20-40 min      | 30-60 min        |
| Fundamental Movement Skills | ★★★                 | ★★☆            | ★★☆              |
| Sport Specific Skills       | ★★☆                 | ★★★            | ★★★★             |
| Strength                    | ★★★                 | ★★★★           | ★★★★             |
| Hypertrophy                 | ☆☆☆                 | ★★★            | ★★★★             |
| Power                       | ★★☆                 | ★★★            | ★★★★             |

Figure 6. Overview of a practical periodization model of training process focus, training focus, structure, duration, and physical qualities emphasis.



# PLANNING & PROGRAMMING

## WEEKLY STRUCTURE

|                      | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Weekly volume |
|----------------------|--------|---------|-----------|----------|--------|----------|--------|---------------|
| Sport Session        | 60'    | 60"     |           | 60"      | 60'    | GAME     |        |               |
| Physical Preparation |        | 40"     |           | 40"      |        |          |        |               |
| Total volume         | 60'    | 100'    |           | 100'     | 60'    |          |        | 320'          |

Figure 8. Weekly proposal for U15-U17 with 4:2 ratio of sport sessions and physical preparation.

|                      | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Weekly Volume |
|----------------------|--------|---------|-----------|----------|--------|----------|--------|---------------|
| Sport Session        | 60'    |         | 60'       |          | 60'    | GAME     |        |               |
| Physical Preparation |        |         | 40'       |          |        |          |        |               |
| Total Volume         | 60'    |         | 100'      |          | 60'    |          |        | 220'          |

Figure 7. Weekly proposal for U13-U15 with a 3:1 ratio of sport sessions and physical preparation.

|                      | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Weekly volume |
|----------------------|--------|---------|-----------|----------|--------|----------|--------|---------------|
| Sport Session        | 60'    | 60"     | 60"       | 60"      | 60'    | GAME     |        |               |
| Physical Preparation | 40"    |         | 40"       | 40"      |        |          |        |               |
| Total volume         | 100'   | 60'     | 100'      | 100'     | 60'    |          |        | 420'          |

Figure 9. Weekly proposal for U17-U19 with 5:3 ratio of sport sessions and physical preparation.

# PLANNING & PROGRAMMING

## DAILY STRUCTURE - SESSIONS

| METHODOLOGY          | DESCRIPTION                                                                                                    | REST                                                                                                                                                 |
|----------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| EXERCISE BY EXERCISE | Perform <b>all sets</b> of one exercise before moving on to the next.                                          | Rest between each set and a longer rest can be implemented between exercises                                                                         |
| SUPERSETS            | Perform <b>one set</b> of 2 exercises straight after each other. Repeat superset to reach total number of sets | Little to no rest between exercises, rest should be implemented between sets.                                                                        |
| TRI-SETS             | Perform <b>one set</b> of 3 exercises straight after each other. Repeat tri-set to reach total number of sets  | Little to no rest between exercises, rest should be implemented between sets.                                                                        |
| CIRCUITS             | Perform <b>one set</b> of 4 or more exercises after each other. Repeat circuit to reach total number of sets   | The circuit can be performed with or without rest between exercises. A longer rest can be implemented before starting the next round of the circuit. |

Figure 10. Overview of methods two combine exercises to strucutre a training session.

| CATEGORY                 | DESCRIPTION                                                                                               | EXAMPLES                                                                                       |
|--------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| LOWER / UPPER BODY       | Exercises targeting muscles in either the upper- or lower body                                            | Back Squats vs. Shoulder Press                                                                 |
| MOVEMENT PATTERN         | Exercises working in the different movement planes (see figure x)                                         | Row (vertical pull) vs. Shoulder Press (horizontal push)                                       |
| MULTI- VS. SINGLE-JOINT  | Exercises targeting more than one muscle group (multi-joint) or isolating one muscle group (single-joint) | Deadlift (multi-joint) vs Bicep curl (single-joint)                                            |
| CONTRACTION              | Exercises working isometric (static), concentric (shortening), eccentric (lengthening)                    | Glute Bridge Hold (isometric) vs. Hamstring curl (concentric) vs. Noridc hamstring (eccentric) |
| BILATERAL VS. UNILATERAL | Exercises working two sides simultaious (bilateral) vs. isolated one side (unilateral)                    | Squats (bilateral) vs. Lunges (unilateral)                                                     |
| AGONIST VS. ANTAGOINST   | Exercises working two opposite muscle groups.                                                             | Biceps curls vs. Triceps pushdowns                                                             |

Figure 11. Overview of ways to categorize exercises when structuring a training session.

DAILY STRUCTURE - EXERCISE SELECTION

- Exercise Selection

|                 | Level 1                           | Level 2                            | Level 3                   | Level 4                | Level 5                |
|-----------------|-----------------------------------|------------------------------------|---------------------------|------------------------|------------------------|
| VERTICAL PUSH   | Single Press from Knee - dumbbell | Single Press from Split - Dumbbell | Standing Press - Dumbbell | Strict Press - Barbell | Push Press             |
| VERTICAL PULL   | Vertical Pull - Band              | Half Pull Up from sitting          | Pull Up - banded          | Pull Up - eccentric    | Pull Up                |
| HORIZONTAL PUSH | Push Up from Wall                 | Push Up from Bench                 | Push Up from Knee         | Push Up                | Bench Press            |
| HORIZONTAL PULL | Standing Row - Band               | Single Row - Band                  | TRX Row 45°               | TRX Row - horizontal   | Single Row - Dumbbells |

Figure 17. Overview of examples of progressions in different strength exercises in fundamental movement planes.

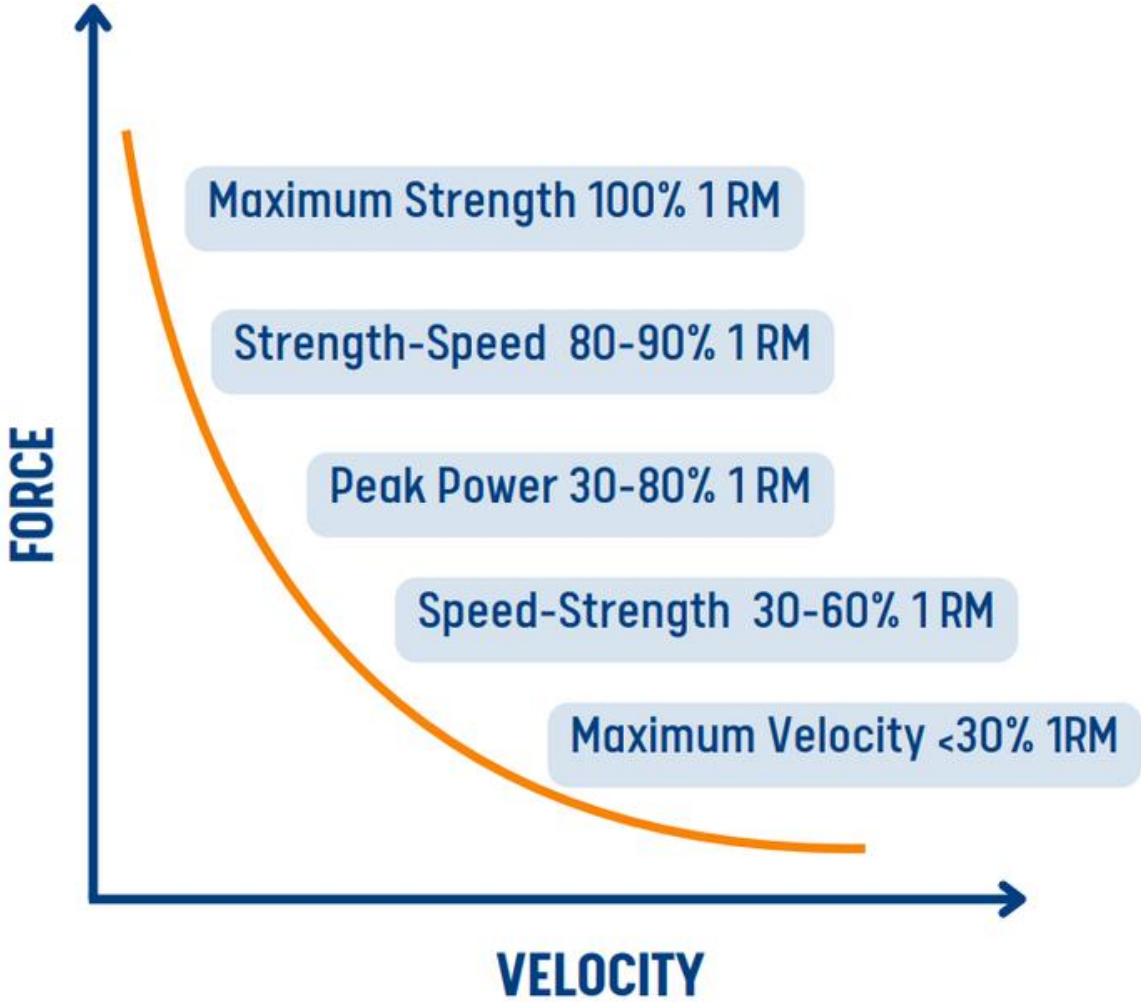
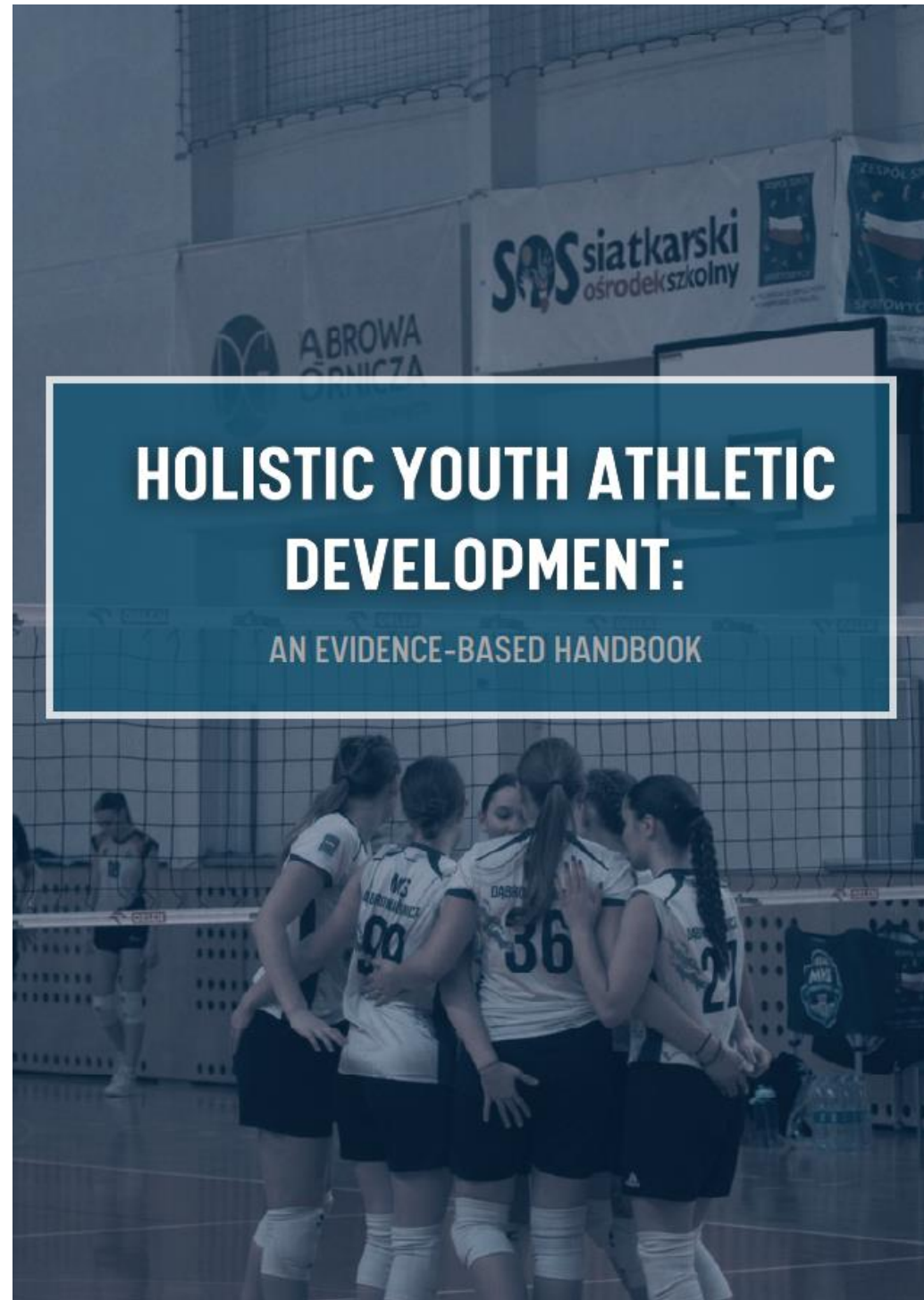


Figure 3. Overview of the force-velocity curve



# PART 1

## the SCIENCE



# PART 2

## the REAL-WORLD



# CONTEX

- JBBL - 20 athletes
- NBBL - 20 athletes
- Athletic training 2 x week: 30-45 min before/after practice
- **challenges:**
  - weight room
  - groups size
  - time





# GENERAL STRUCTURE & SPECIFIC ADJUSTMENTS

## ADJUSTMENTS

### JBBL

- Learn how to train → train to train
- Variation maturation status
- Start with easier level of progression

### NBBL

- train to train → train to compete
- Variation training history
- Higher level in progressions (many times goals exercise)

**SIMILAR PROGRAMS, SMALL ADJUSTMENTS!**

|                             | U13-U15             | U15-U17        | U17-U19          |
|-----------------------------|---------------------|----------------|------------------|
| Process Focus               | Learn to Train      | Train to Train | Train to Compete |
| Training Focus              | General Development | Transition     | Sport Specific   |
| Session Structure           | Moderate            | High           | Very High        |
| Session Duration            | 20-40 min           | 20-40 min      | 30-60 min        |
| Fundamental Movement Skills | ★★★                 | ★★☆            | ★★☆              |
| Sport Specific Skills       | ★★☆                 | ★★★            | ★★★★             |
| Strength                    | ★★★                 | ★★★★           | ★★★★             |
| Hypertrophy                 | ☆☆☆                 | ★★★            | ★★★★             |
| Power                       | ★★☆                 | ★★★            | ★★★★             |

Figure 6. Overview of a practical periodization model of training process from training focus, training structure, session duration, and physical qualities emphasis.



# EXAMPLE SESSIONS

**A1)** TRAPBAR DEADLIFT

**A2)** DEAD BUG

**B1)** SINGLE GLUTE BRIDGE (ISOMETRIC)

**B2)** SINGLE ROW DUMBBELL

**C1)** PUSH UP

**C2)** FRONTAL MEDBALL THROW

**C3)** LATERAL LANDINGS

**A1)** PULL UPS

**A2)** LATERAL MEDBALL THROW

**B1)** BACK LUNGES

**B2)** POGO JUMPS

**C1)** SINGLE SHOULDER PRESS

**C2)** PIGEON - DISC

# 3 CASES

## PLAYER A

Patella tendon problems  
“jumper”



## PLAYER B

Tall, grew a lot very fast →  
low body control



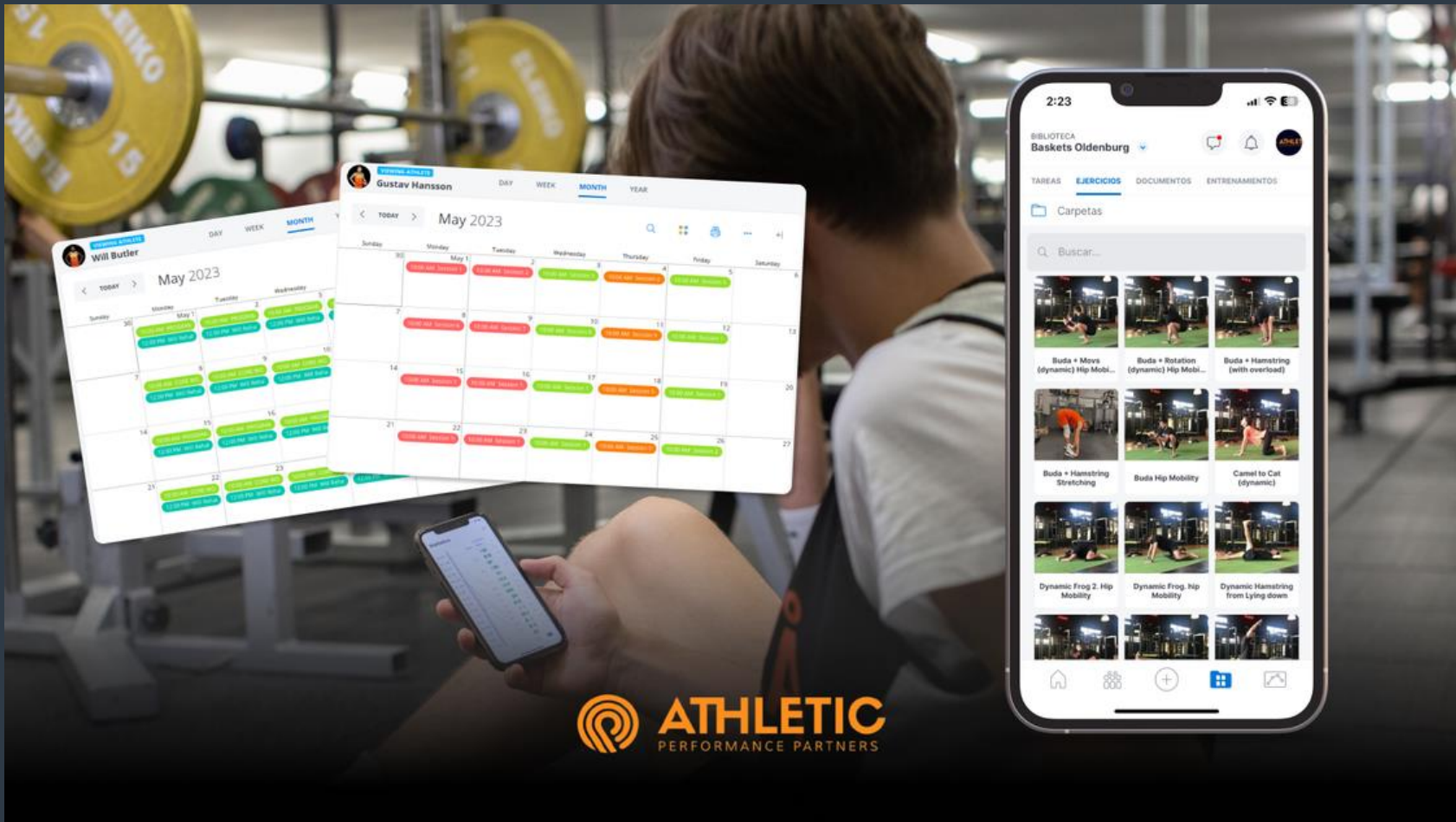
## PLAYER C

young but early matured,  
super strong



# NBBL OFF-SEASON PROJECT

- 1. Testing
- 2. Evaluation
- 3. Individual Programs



### TEST REPORT - NBBL



Position: Forward

Height (cm): 197

Weight (kg): 90

Date: 2026-05-05



|                | 40kg | 50kg | 60kg | 70kg | 1RM /Load @PP | PULL-UPS |
|----------------|------|------|------|------|---------------|----------|
| Velocity (m/s) | 0.94 | 0.74 | 0.64 | 0.65 | 82.77         | 9        |
| Power (W)      | 1211 | 1052 | 1148 | 1057 | 40 kg         |          |

\*Load @PP= Load at peak power; at which weight (out of the tested ones) the most power is produced (power = force\*velocity)

|                | 65kg | 85kg | 105kg | 115kg | 1RM /Load @PP |
|----------------|------|------|-------|-------|---------------|
| Velocity (m/s) | 0.93 | 1.05 | 0.9   | 0.83  | 221.69        |
| Power (W)      | 1657 | 3273 | 2838  | 2995  | 85 kg         |

\*Load @ PP = Load at Peak Power: the load at which the highest power output is produced among the tested weights.

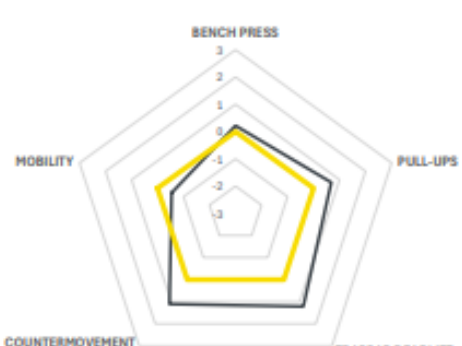
#### SUMMARY & GOALS

Very balanced profile with very good strength and power production, especially relative to body weight and the lower body. Would benefit from further increasing overall strength levels, with a particular focus on upper body strength and power production.

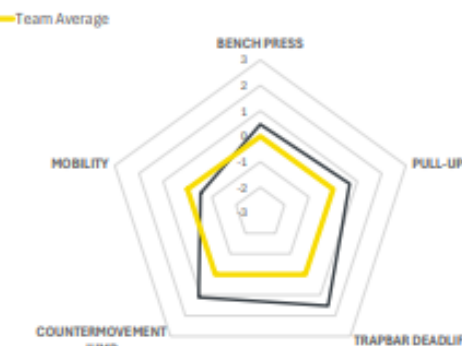
|                  | 60%     | 70%     | 75%     | 80%     | 85%     | 90%     | 95%     | 100%   |
|------------------|---------|---------|---------|---------|---------|---------|---------|--------|
| Bench Press (kg) | 49,662  | 57,939  | 62,0775 | 66,216  | 70,3545 | 74,493  | 78,6315 | 82,77  |
| Deadlift (kg)    | 133,014 | 155,183 | 166,268 | 177,352 | 188,437 | 199,521 | 210,606 | 221,69 |

#### OVERVIEW

##### ABSOLUTE VALUES



##### RELATIVE VALUES





**THANK  
YOU!**