

SPORTS AND EXERCISE PHYSIOLOGY CENTRE & GYM



RESULTS AND ANALYSIS OF ERGOMETRIC MEASUREMENTS

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General / Health Measurements

Height: 170cm

Weight: 62.8kg

Body Fat: 17.7%

Partial skinfold measurements (mm):

| Abdominal | Thigh | Tricep | Suprailiac |
|-----------|-------|--------|------------|
| 11 | 18 | 17 | 12 |

Flexibility: 25.0 (Mod. Scale)

Comments:

- Height and weight in excellent ratio.
- Body fat within ideal athletic percentage range (16 – 22%) – maintain as is (great reductions might lead to fatigue and decreased performance).
- Exceptional lower back and leg flexibility – maintain as is.

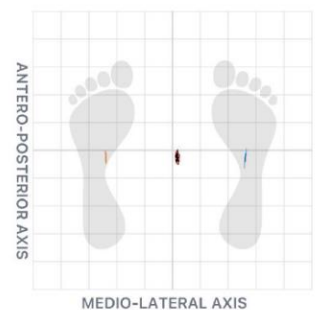
Strength Measurements / K-Force

Measurements using the Plates:

Bipodal Stance:

Centre of balance slightly towards the right side but in the middle (black circle). Left leg is slightly more stable than the right, however the difference is minimal and non-significant

Weight distribution: 51.2% to the right and 48.8% to the left – deviation is non-significant at 4.7%. Attention when standing to distribute the weight to both legs and not “stand” more on the right leg.

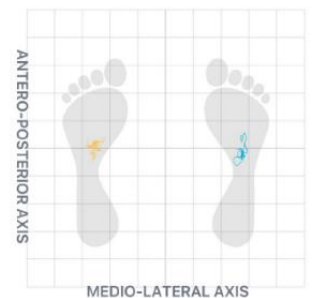


Single leg stance:

Right foot stance: Heel: 51.4% (Norm: 60%) Tip: 48.6% (Norm: 40%)

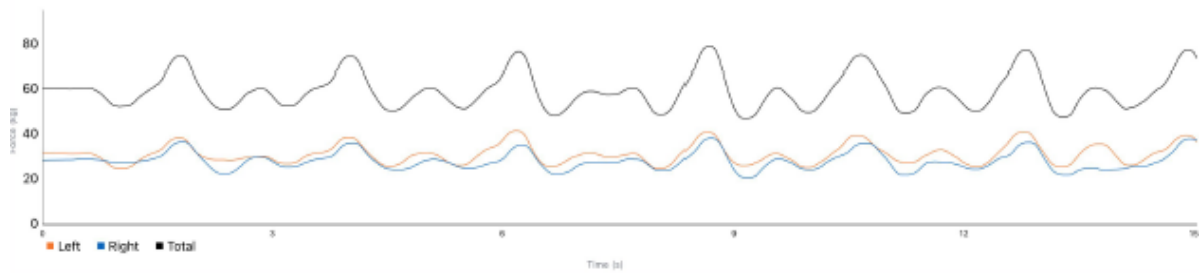
Left foot stance: Heel: 49.4% (Norm: 60%) Tip: 50.6% (Norm: 40%)

Weight is distributed mainly towards the front of the foot in both legs. Balance is good, however more surface is needed for the stabilization of the right leg than the left (as with the bipodal stance).



Squat analysis:

Distribution during the whole measurement:



Peak forces: Max (kg): Right:38.4, Left: 41.1 Dev.: 6.6% (non-significant)

Weight shift consistency:

Average (%): Right: 47.5, Left: 52.5 Max. Right: 52.5% Max. Left: 59.5%

When squatting, in contrast with the passive bipodal stance, more weight is distributed on the left leg instead of the right. This applies for both loading and unloading phases of the movement. The deviation is at 9.5% which while it remains non-significant, it is higher than the passive stance.

Push-down analysis (Service move):

| | Right | Left | Deviation |
|------------|-------|-------|--------------|
| Peak Force | 5.8kg | 8.0kg | 27.5% |
| Average | 4.6kg | 6.6kg | 30.3% |

Left arm significantly stronger than the right in this movement. As mentioned during the testing session, this is a common finding in volleyball players as the dominant arm (the right in this case) is used constantly. As long as both arms are trained equally, the above finding is a result of fatigue due to “overuse” of one arm over the other.

- **Main take-away: minimal deviations between the right and left extremity in all measurements. Mindfulness on the weight distribution during the squat movement is recommended but no other measures are needed. Strengthening and stretching of the shoulders to be continued as is but attention on the rehabilitation/recovery especially of the right shoulder/arm.**

Vertical Jump & Reaction Measurements / Optogait

Types of different vertical jump measurements:

| | Maximum Jump Height (cm) | Average Jump Height (cm) |
|--------------------------|--------------------------|--------------------------|
| Squat Jump | 27.4 | 27.1 |
| CMJ | 26.8 | 26.7 |
| CMJ – Right | 22.0 | 20.5 |
| CMJ – Left | 23.5 | 22.0 |
| CMJ free arms – Block | 34.0 | 32.6 |
| CMJ free arms – Approach | 40.2 | 36.8 |

Comments and remarks:

- Block Jump: Total height of 257cm.
- Approach Jump: Total height of 263.2cm
- The deviation between right and left leg is small (6.4% on max height and 6.8% on average height) which is ideal.
- All values are considered standard and can be compared to international players of this age (European Volleyball Confederation (CEV), Rankings 9th- 30th). However, there is further room for improvement to reach the values of higher levels (CEV Rankings 1st – 9th) - <https://www.mdpi.com/1660-4601/18/16/8377> .

Table 2. Anthropometric, physical, and age characteristics of junior female volleyball players regarding position and performance level.

| | Performance Level | Setter ¹ | Opposite ² | Middle Blocker ³ | Outside ⁴ | Libero ⁵ | Σ |
|---------------------------|-------------------|--------------------------|------------------------------|-------------------------------|----------------------------|-------------------------|---------------|
| Body height (m) | 1 | 1.81 ± 0.06 ⁵ | 1.88 ± 0.03 ^{1,4,5} | 1.87 ± 0.04 ^{1,4,5} | 1.84 ± 0.04 ^{1,5} | 1.71 ± 0.05 | * 1.83 ± 0.07 |
| | 2 | 1.78 ± 0.06 ⁵ | 1.84 ± 0.04 ^{1,5} | 1.87 ± 0.05 ^{1,3,5} | 1.83 ± 0.05 ^{1,5} | 1.73 ± 0.04 | * 1.82 ± 0.07 |
| | 3 | 1.77 ± 0.03 ⁵ | 1.81 ± 0.06 | 1.83 ± 0.04 ^{1,4,5} | 1.78 ± 0.04 ⁵ | 1.62 ± 0.05 | * 1.78 ± 0.07 |
| | Σ | 1.79 ± 0.05 | † 1.85 ± 0.05 | † 1.86 ± 0.05 | † 1.82 ± 0.05 | † 1.71 ± 0.06 | 1.81 ± 0.07 |
| Body mass (kg) | 1 | 68.4 ± 7.0 ⁵ | 72.1 ± 5.5 ⁵ | 73.3 ± 5.9 ^{4,5} | 70.3 ± 5.6 ⁵ | 61.5 ± 5.1 | * 69.8 ± 6.8 |
| | 2 | 63.8 ± 5.0 | 66.6 ± 7.1 ⁵ | 71.3 ± 7.0 ^{1,2,4,5} | 65.8 ± 5.5 ⁵ | 62.1 ± 4.3 | * 66.3 ± 6.5 |
| | 3 | 65.2 ± 6.9 | 65.9 ± 10.9 | 67.8 ± 6.3 | 64.6 ± 6.3 | 58.3 ± 5.6 | 65.0 ± 7.3 |
| | Σ | 66.0 ± 6.5 | 68.6 ± 8.1 | † 71.5 ± 6.6 | † 67.5 ± 6.2 | 61.2 ± 5.1 | 67.5 ± 7.1 |
| BMI (kg/m ⁻²) | 1 | 21.0 ± 2.0 | 20.5 ± 1.3 | 21.0 ± 1.4 | 20.8 ± 1.6 | 20.9 ± 1.3 | 20.8 ± 1.6 |
| | 2 | 20.1 ± 1.4 | 19.7 ± 1.8 | 20.3 ± 1.6 ⁴ | 19.5 ± 1.2 | 20.7 ± 1.5 ⁴ | * 20.0 ± 1.5 |
| | 3 | 20.7 ± 1.8 | 20.1 ± 2.3 | 20.3 ± 1.6 | 20.4 ± 1.8 | 22.1 ± 1.8 | 20.6 ± 1.8 |
| | Σ | 20.6 ± 1.8 | 20.1 ± 1.7 | 20.6 ± 1.6 | † 20.3 ± 1.6 | 21.0 ± 1.5 | 20.5 ± 1.6 |
| Spike jump (m) | 1 | 2.89 ± 0.09 ⁵ | 3.04 ± 0.12 ^{1,4,5} | 3.00 ± 0.09 ^{1,5} | 2.97 ± 0.10 ^{1,5} | 2.77 ± 0.11 | * 2.95 ± 0.13 |
| | 2 | 2.87 ± 0.10 ⁵ | 2.90 ± 0.10 ⁵ | 2.95 ± 0.10 ^{1,5} | 2.94 ± 0.12 ^{1,5} | 2.78 ± 0.16 | * 2.91 ± 0.13 |
| | 3 | 2.75 ± 0.16 ⁵ | 2.75 ± 0.21 ⁵ | 2.81 ± 0.16 ⁵ | 2.84 ± 0.16 ⁵ | 2.59 ± 0.15 | * 2.78 ± 0.18 |
| | Σ | 2.84 ± 0.13 | † 2.92 ± 0.19 | † 2.95 ± 0.13 | † 2.93 ± 0.13 | † 2.74 ± 0.15 | 2.90 ± 0.15 |
| Block jump (m) | 1 | 2.75 ± 0.09 ⁵ | 2.92 ± 0.11 ^{1,4,5} | 2.85 ± 0.16 ^{1,5} | 2.83 ± 0.10 ^{1,5} | 2.63 ± 0.14 | * 2.80 ± 0.15 |
| | 2 | 2.76 ± 0.10 ⁵ | 2.77 ± 0.10 ⁵ | 2.83 ± 0.10 ^{1,5} | 2.80 ± 0.11 ⁵ | 2.65 ± 0.16 | * 2.78 ± 0.13 |
| | 3 | 2.65 ± 0.18 ⁵ | 2.58 ± 0.28 | 2.70 ± 0.20 ⁵ | 2.71 ± 0.18 ⁵ | 2.44 ± 0.21 | * 2.66 ± 0.21 |
| | Σ | 2.73 ± 0.13 | † 2.78 ± 0.22 | † 2.81 ± 0.16 | † 2.79 ± 0.13 | † 2.61 ± 0.17 | 2.76 ± 0.17 |
| Age (years) | 1 | 17.7 ± 0.6 | 17.0 ± 1.0 | 17.5 ± 0.8 | 17.3 ± 0.9 | 17.6 ± 0.7 | 17.4 ± 0.8 |
| | 2 | 17.6 ± 0.5 | 17.2 ± 0.8 | 17.4 ± 0.6 | 17.3 ± 0.9 | 17.4 ± 0.7 | 17.4 ± 0.8 |
| | 3 | 17.5 ± 0.9 | 16.9 ± 1.1 | 17.4 ± 0.7 | 17.2 ± 0.9 | 17.4 ± 0.8 | 17.3 ± 0.9 |
| | Σ | 17.6 ± 0.7 | 17.0 ± 1.0 | 17.5 ± 0.7 | 17.3 ± 0.9 | 17.5 ± 0.7 | 17.4 ± 0.8 |

Significantly different from: ¹—Setter; ²—Opposite; ³—Middle blocker; ⁴—Outside; ⁵—Libero; *—significantly different by player position; †—significantly different by performance level.

- In all jumps, no major fault in technique was identified.
 - The initial position of the knees and ankles is good
 - During push-off, both knees and ankles hold their good position – there is no sign of inward collapse or other weakness
 - There is only a minimal shift towards the front during the flight
 - The landings appear stable; on both feet and well-balanced. However, there are inconsistent, meaning that one landing was made slightly to the right, other slightly to the left and other on the exact same position as the jump.

Reaction & Explosiveness measurements:

| | Reaction Time (sec) | | Contact Time (sec) | |
|-----------------|---------------------|--------------|--------------------|--------------|
| | Fastest | Average | Fastest | Average |
| Visual R (side) | 0.470 | 0.532 | 0.099 | 0.130 |
| Visual L (side) | 0.447 | 0.511 | 0.112 | 0.119 |
| Deviation (%) | 4.9 | 3.9 | 11.6 | 8.5 |

Comments and remarks:

- The fastest reactions of both legs are exceptional, well below the 0.500sec mark (considered as the cut-off point between professional and amateur). The average reaction times (5 measurements) is slightly higher but remains excellent.
- The reaction time on the left is faster but deviations are minimal.
- Contact time represents the time spent where the foot is in contact with the ground after reacting to the signal = explosiveness.
 - All values are also exceptional; below the 0.200sec mark.
- The right side has a faster contact time (singular) with the ground than the left, with a higher deviation.
- However, when it comes to the average contact time values, the left is faster.
- Focus point: the consistency between repetitions in order to bring the average values closer to the singular fastest one.