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powrlink®

THE LINK TO YOUR PERFORMANCE

ISOMETRIC STRENGTH TESTING

powrlink fitness sensors

Shoulder Extension

Facing the sensor and standing tall with feet together, the elbow of the side tested should be flexed at 90° degrees, with the elbow joint in light contact with the torso, the forearm in the same line as the sensor, the wrist joint in neutral position and with the thump pointing towards the ceiling (Fig. 1). The aerobis Flex XL handle is placed on the upper arm as close to the elbow as possible.

The opposite arm should remain relaxed and in light contact with the torso. Maintaining a neutral spine and pelvic position, the participant is instructed to slowly press the arm backwards against the handle.

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Press your arm slowly backwards against the Flex handle
- Do not allow your shoulders and pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

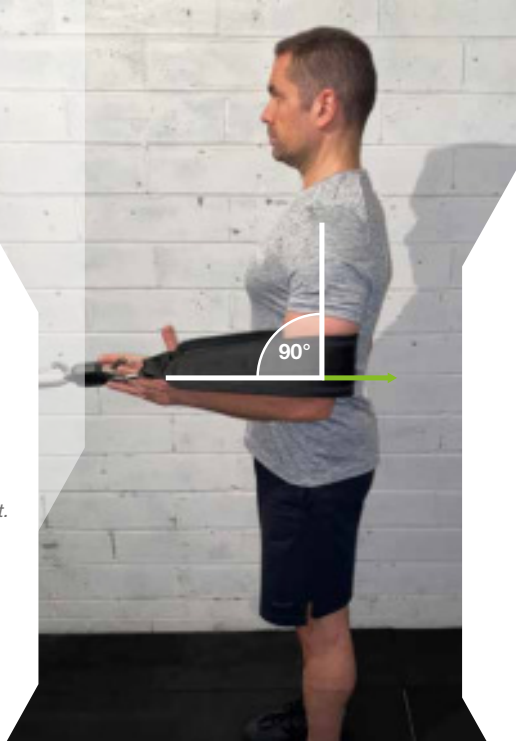


Figure 1.

Shoulder extension assessment. Arrow indicates the direction of force application.

Shoulder Flexion

With the back side facing the sensor and standing tall with feet together, the elbow of the side tested should be flexed at 90° degrees, with the elbow joint in light contact with the torso, the forearm in the same line as the sensor, the wrist joint in neutral position and with the thump pointing towards the ceiling (Fig. 2). The aerobis Flex XL handle is placed on the upper arm as close to the elbow as possible.

The opposite arm should remain relaxed and in light contact with the torso. Maintaining a neutral spine and pelvic position, the participant is instructed to slowly press the arm forwards against the handle.

Figure 2.

Shoulder flexion assessment. Arrow indicates the direction of force application.

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Press your arm slowly forwards against the Flex handle
- Do not allow your shoulders and pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

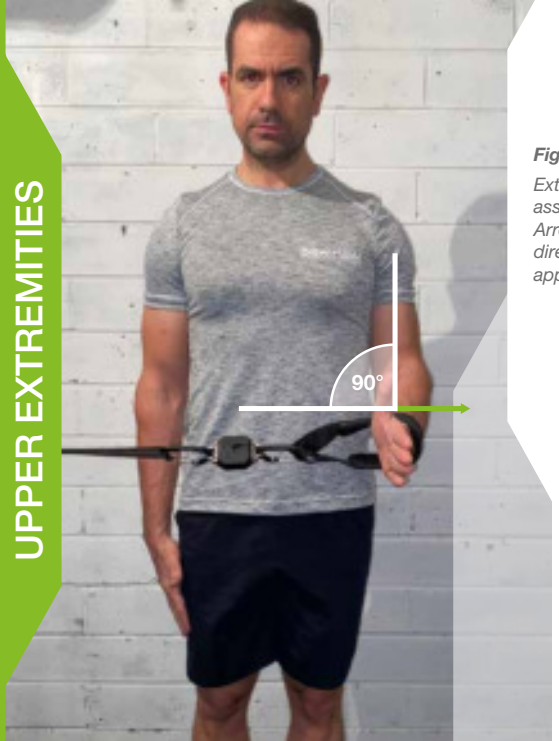


Figure 3.

External rotation assessment. Arrow indicates the direction of force application.

Shoulder external rotation

Standing sideways to the sensor, maintaining a tall posture with feet together, the outside arm (side tested) is flexed 90° degrees at the elbow, with the joint in light contact with the torso, the wrist joint in neutral position and at 90° degrees to the sensor, and with the thump pointing towards the ceiling (Fig. 3). The aerobis Flex small handle is placed on the lower arm as close to the wrist joint as possible. The opposite arm should remain relaxed and in light contact with the torso. Maintaining a neutral spine and pelvic position, the participant is instructed to slowly press the wrist against the Flex handle outwards and away from the anchor point.

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Press the wrist slowly against the Flex handle outwards and away from the anchor point
- Do not allow your shoulders and pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Shoulder internal rotation

Standing sideways to the sensor, maintaining a tall posture with feet together, the inside arm (side tested) is flexed 90° degrees at the elbow, with the joint in light contact with the torso, the wrist joint in neutral position and at 90° degrees to the sensor, and with the thump pointing towards the ceiling (Fig. 4).

The aerobis Flex small handle is placed on the lower arm as close to the wrist joint as possible. The opposite arm should remain relaxed and in light contact with the torso. Maintaining a neutral spine and pelvic position, the participant is instructed to slowly press the wrist against the Flex handle inwards and away from the anchor point.

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Press the wrist slowly against the Flex handle inwards and away from the anchor point
- Do not allow your shoulders and pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

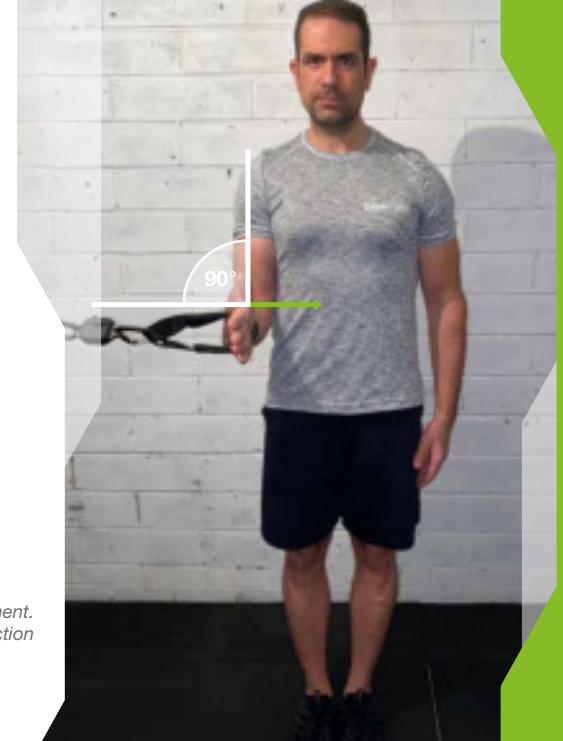


Figure 4.

Internal rotation assessment. Arrow indicates the direction of force application.

Spine rotation

Standing tall with feet together, the back side is facing the sensor. The elbows are bend at 90° degrees, with the arms folded and pressed against the body (Fig. 5). The fist of the arm holding the handle is in the same line as the sensor and in contact with the midaxillary line of the torso, whilst the opposite hand holds the upper arm near the elbow. Maintaining a neutral spine and pelvic position, the participant is instructed to turn the shoulder of the arm holding the handle slowly backwards, with the head following the rotation of the trunk.

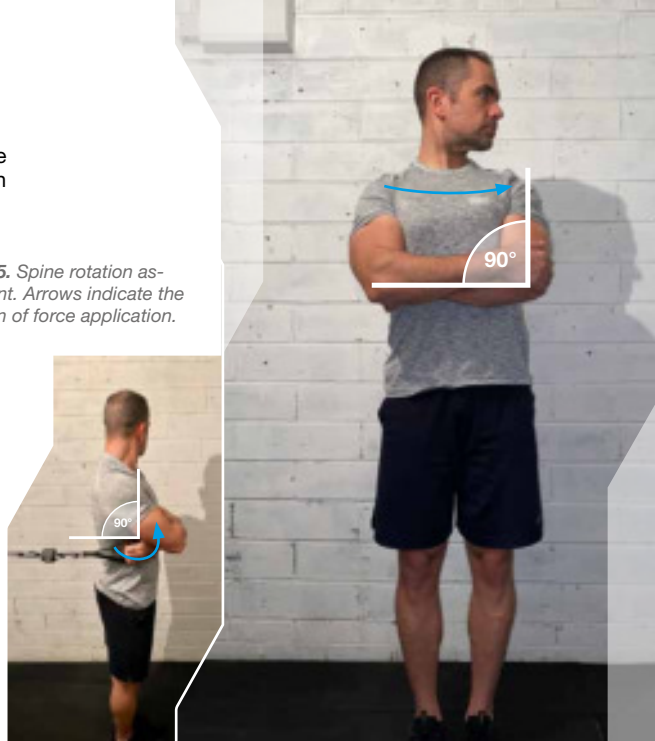


Figure 5. *Spine rotation assessment. Arrows indicate the direction of force application.*

VERBAL INSTRUCTIONS (FOR TESTING THE RIGHT SIDE):

- Stand tall with your feet looking straight throughout the test
- Use your right hand to hold your left elbow in place
- Turn you left shoulder slowly backwards, with the head following the trunk rotation
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Spine lateral flexion

Standing sideways to the sensor, maintaining a tall posture with feet together, the elbows are bend at 90° degrees, with the arms folded and pressed against the body (Fig. 6). The fist of the arm away from the sensor is holding the handle and is in the same line as the sensor, whilst the opposite hand is used to hold the elbow in place. Maintaining a neutral spine and pelvic position, the participant is instructed to slowly drop the shoulder of the arm holding the handle, with the head maintaining a neutral position.

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Use your right hand to hold your left elbow in place
- Slowly drop your left shoulder
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

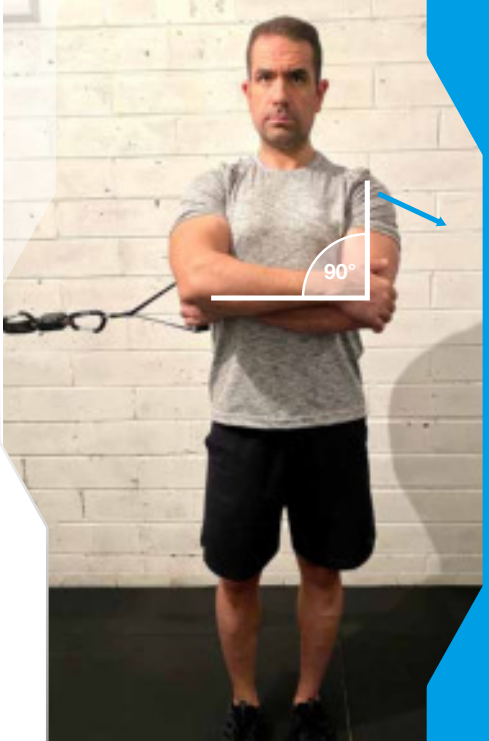
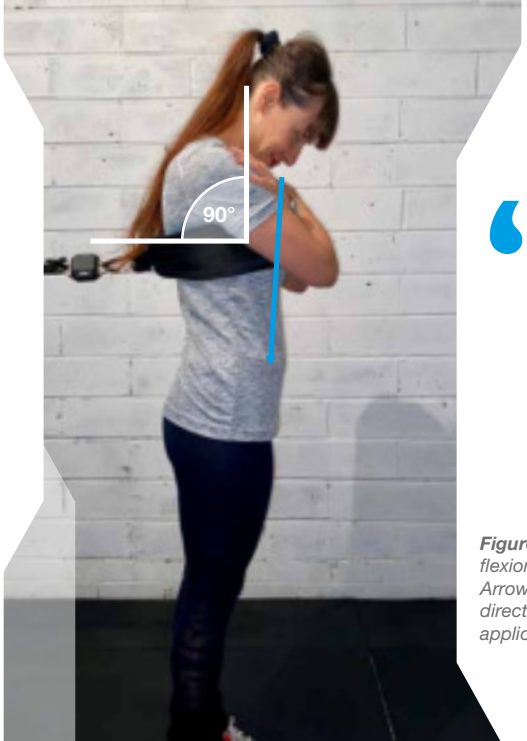


Figure 6. Spine lateral flexion assessment. Arrow indicates the direction of force application.

Spine flexion

Standing tall with feet together, the back side is facing the sensor. With the aerobis Flex XL handle placed directly in the axillary folds, and the arms folded and pressed against the body, the participant is instructed to slowly press against the handle (but not lean against it) while rolling the head slightly down, directing the nose towards the knees (Fig. 7).



VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Fold your arms in front of your chest and press them against your body
- Slowly press against the handle while rolling your nose towards your knees
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Figure 7. *Spine flexion assessment. Arrow indicates the direction of force application.*

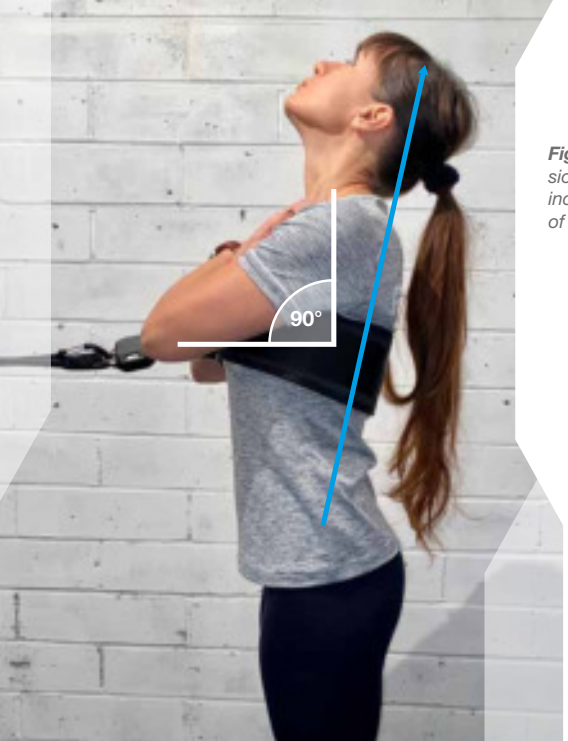


Figure 8. Spine extension assessment. Arrow indicates the direction of force application.

Spine extension

Facing the sensor and standing tall with feet together, the aerobis Flex XL handle is placed directly in the axillary folds. With the arms folded and pressed against the body, the participant is instructed to slowly press against the handle (but not lean against it) while rolling the head slightly backwards, directing the nose towards the ceiling (Fig. 8).

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Fold your arms in front of your chest and press them against your body
- Slowly press against the handle while rolling your nose towards the ceiling
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Hip extension

Facing the sensor and standing tall with feet together, the ankle joint of the side tested is in the same line as the sensor, with the aerobis small Flex handle placed as close as possible to the ankle (Fig. 9). Whilst maintaining a tall and neutral spine position, with the knee joint extended and the ankle joint in neutral position, the participant is instructed to press the leg slowly backwards against the handle.

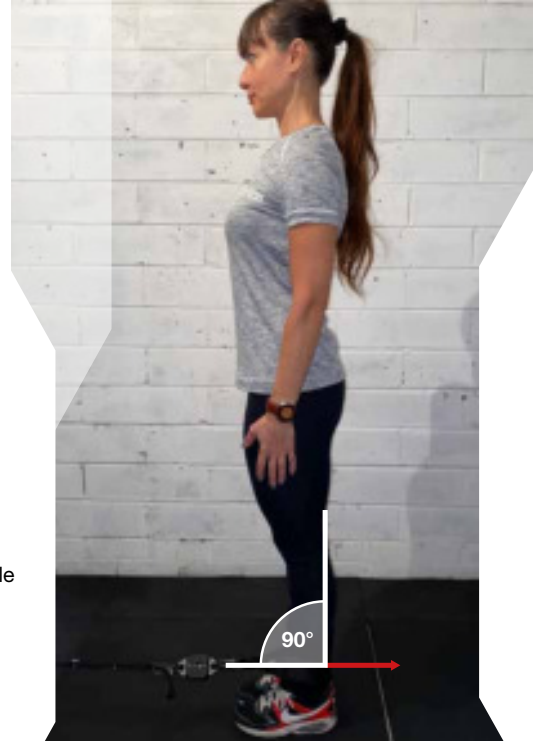


Figure 9. *Hip extension assessment. Arrow indicates the direction of force application.*

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Keep your arms relaxed and down by your sides
- Keeping your knee straight, press your leg slowly backwards against the flex handle
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Hip flexion

Standing tall with feet together, the back side is facing the sensor, the ankle joint of the side tested is in the same line as the sensor, with the aerobis small Flex handle placed as close as possible to the ankle joint (Fig. 10). Whilst maintaining a tall and neutral spine position, with the knee joint extended and the ankle joint in neutral position, the participant is instructed to press the leg slowly forwards against the handle.

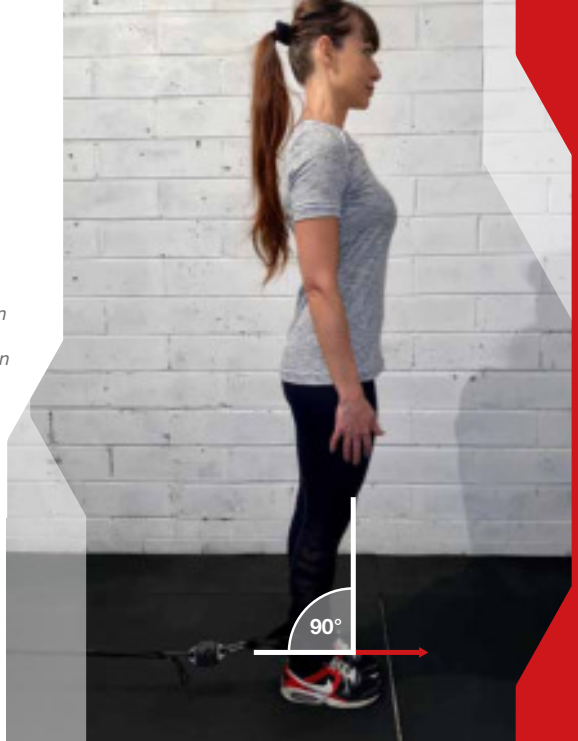


Figure 10. *Hip flexion assessment. Arrow indicates the direction of force application.*

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Keep your arms relaxed and down by your sides
- Keeping your knee straight, press your leg slowly forwards against the flex handle
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Figure 11. *Hip adduction assessment. Arrow indicates the direction of force application.*

Hip adduction

Standing sideways to the sensor, maintaining a tall posture with feet together, the inside ankle joint (side tested) is in the same line as the sensor and the aerobis small Flex handle is placed as close as possible to the ankle joint (Fig. 11). Whilst maintaining a tall and neutral spine position, with the knee joint remaining extended and the ankle in neutral position, the participant is instructed to press the leg slowly inwards against the band.

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Keep your arms relaxed and down by your sides
- Keeping your knee straight, press the leg slowly inwards against the flex handle
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Hip abduction

Standing sideways to the sensor, maintaining a tall posture with feet together, the outside ankle joint (side tested) is in the same line as the sensor and the aerobis XL Flex handle is placed as close as possible to the ankle joint, with the opposite inside leg placed inside the handle (Fig. 12).

Whilst maintaining a tall and neutral spine position, with the knee joint remaining extended and the ankle in neutral position, the participant is instructed to press the leg slowly outwards against the band.

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Keep your arms relaxed and down by your sides
- Keeping your knee straight, press the leg slowly outwards against the Flex handle
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

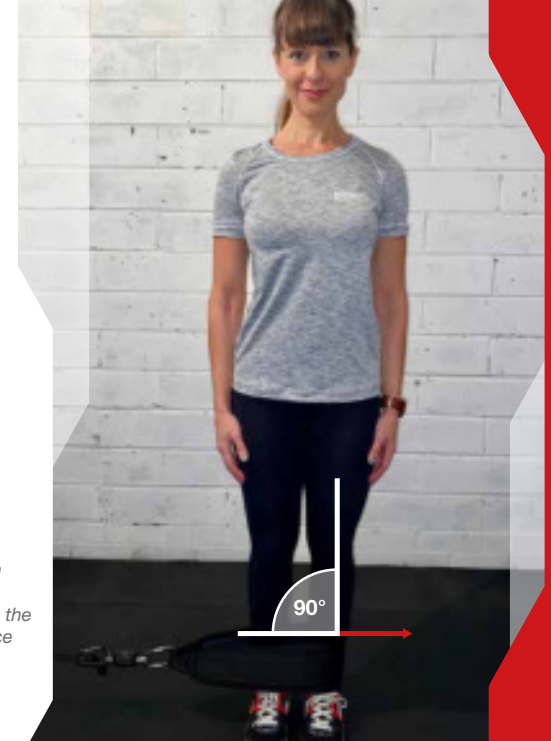


Figure 12.
HHip abduction assessment. Arrow indicates the direction of force application.

Knee extension

From a seated position with the back side facing the sensor, the arms are placed relaxed on the thighs, and the knee joint is flexed at 90° degrees and placed at the edge of the chair or bench (Fig. 13). The ankle joint is in the same line as the sensor and the aerobis small Flex handle placed as close as possible to the ankle joint. Maintaining a straight back, the participant is instructed to press the leg slowly forwards against the handle.

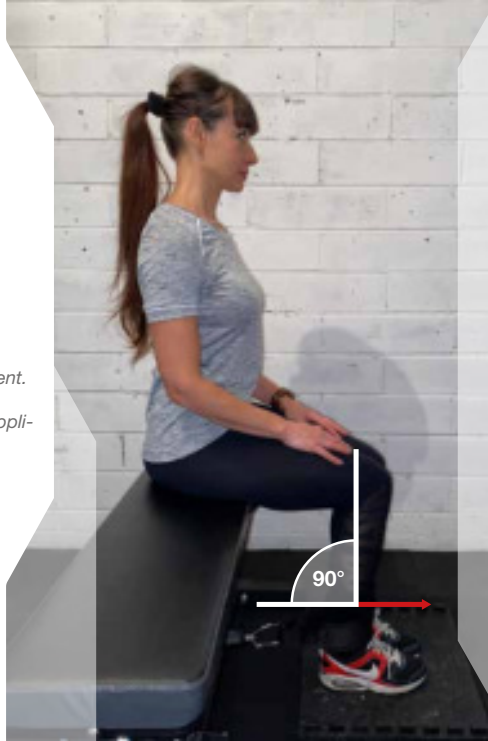


Figure 13. *Knee extension assessment. Arrow indicates the direction of force application.*

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Keep your arms relaxed on your thighs
- Press your leg slowly forwards against the Flex handle
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

Knee Flexion

From a seated position, facing the sensor, the arms are placed relaxed on the thighs, and the knee joint is flexed at 90° degrees and placed at the edge of the chair or bench (Fig. 14). The ankle joint is in the same line as the sensor and the aerobis small Flex handle placed as close as possible to the ankle joint. Maintaining a straight back, the participant is instructed to press the leg slowly backwards against the handle.

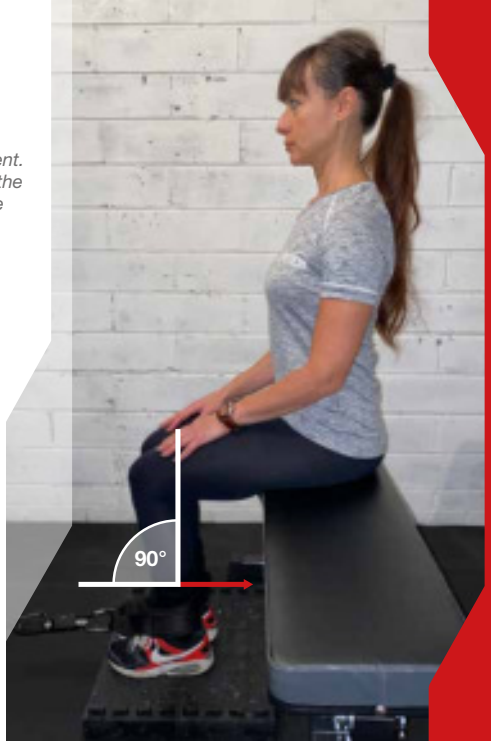


Figure 14. *Knee flexion assessment. Arrow indicates the direction of force application.*

VERBAL INSTRUCTIONS:

- Stand tall with your feet looking straight throughout the test
- Keep your arms relaxed and down by your sides
- Press your leg slowly backwards against the Flex handle
- Do not allow your pelvis to rotate
- If you feel any pain during the test stop the assessment
- Do you understand the instructions?

powrlink fitness sensors

powrlink Isometric Strength Testing

Dr Joseph Esformes, MSc, PhD, CSCS

GENERAL GUIDELINE INSTRUCTIONS

For all assessments hold the Powrlink sensor in a stable position, and the anchor strap attached to the sensor taut at the beginning of each assessment. The participant should be instructed to increase the isometric muscle tension they apply to the sensor (by holding the position statically) continually and gradually until no further increases in muscle strength are noticed, with the maximal contraction lasting no more than 6 seconds. If pain is reported in any of the assessments the test should be ceased and the participant referred to a medical practitioner.

To appreciate the aims of the each assessment and increase measurement reliability, a minimum of one, and up to three familiarisation sessions are recommended, with trained athletes generally requiring less sessions. The tester should ensure that the same testing conditions are maintained, with the set-up and verbal instructions remaining the same for repeated testing sessions.

Following a standardised warm-up, consisting of light aerobic exercise and dynamic stretching, the participant should perform a series of isometric (static) contractions at progressively higher intensities of 50, 70 and 90% of maximum effort, before executing three maximal-effort consecutive trials, with 45-second to 1 minute rest intervals allowed between each trial. The highest strength value achieved should be used for further analysis.

ABOUT THE AUTHOR

Dr Joseph Esformes has a Bachelor Degree in Sport Science and Physical Education from College of Sport Sciences (Athens, Greece), a Master Degree in Sport and Exercise Science from Manchester Metropolitan University, a Doctorate Degree in Exercise Physiology from the University of Leeds, and has attained his Certification of Strength and Conditioning through the NSCA.

Before embarking in an academic career, Joseph worked as a fitness instructor and strength coach for more than a decade. Since 2005, he has been a full-time University Lecturer and is currently a Senior Lecturer in Strength and Conditioning at Cardiff Metropolitan University and an instructor for Functional Movement Systems, delivering courses on the Functional Movement Screen (FMS) and corrective exercise. Previously, he taught Exercise Physiology at the University of Leeds and Sport Conditioning at the University of West of England. His research is in the areas of Strength and Conditioning and Cardiovascular Physiology. He has published in international peer-reviewed journals and presented in international conferences in North America and Europe.

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