



# Client Movement Screening (FMS & LESS)

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# Introduction

We require dynamic stability-based tests in our client screening protocols because understanding movement competency is key in prescribing safe and effective exercise, as well as minimising injury risk.

# Functional Movement Screening (FMS)

Functional Movement Screening (FMS) has for many years been used to establish a subject's movement potential. It highlights areas that the subject is strong at as well as areas that the subject should strengthen in order to improve. For this reason, it is considered a potentially important tool that can inform exercise prescription.

# FMS protocol

- FMS screening requires a subject to complete 7 movement-based tests
- During each movement, the subject's skill and control should be assessed and graded according to the criteria listed in the following slides
- Subjects may be videoed from the front and side views
- A video of the FMS tests can be found [here](https://youtu.be/nhwSDD0s3ko)  
(<https://youtu.be/nhwSDD0s3ko>)

# The 7 FMS screening tests

| FMS test    | Purpose  | Required physical capacities   | Common dysfunctions  |
|-------------|--|--|--|
| Deep squat  | Global mobility and stability in fundamental movement pattern                                  | Talo-crural joint mobility<br>Knee stability<br>Hip mobility<br>Lumbo-pelvic control<br>Thoracic mobility<br>Gleno-humeral joint stability | Tibial external rotation<br>Knee valgus<br>Forward trunk lean<br>Pelvic tucking<br>Arms fall forward |
| Hurdle test | To identify unilateral asymmetries and deemed an important part of locomotion and acceleration | Ankle stability<br>Knee stability<br>Hip mobility<br>Lumbo-pelvic control  | Loss of balance<br>Hip hike/drop<br>Lateral flexion of the spine                                     |

# The 7 screening tests

| FMS test          | Purpose  | Required physical capacities  | Common dysfunctions  |
|-------------------|--|---|--|
| Inline lunge      | Challenges the mobility and stability of the ankle, knee and hip joints                        | Talo-crural joint mobility<br>Knee stability<br>Hip mobility  | Feet flatten<br>Knee valgus<br>Increased hip flexion   |
| Shoulder mobility | Assesses mobility around scapular-thoracic region in an upper body reciprocal movement pattern | Thoracic extension<br>Shoulder adduction/abduction<br>Shoulder flexion/extension<br>Shoulder internal/external rotation | Reduced capacity to meet fists to one another (product of reduced mobility in one or more physical capacities) |

# The 7 screening tests

| FMS test                  | Purpose   | Required physical capacities                            | Common dysfunctions  |
|---------------------------|---|---|--|
| Active straight leg raise | Assesses hip flexion and knee extension capacities in an unloaded environment | Hip mobility<br>Lumbo-pelvic stability                  | Reduced hip flexion range of motion<br>Excessive lumbar extension<br>Femoral external rotation (resting leg)<br>Knee flexion (resting leg) |
| Trunk stability           | View the client's ability to stabilise the trunk region                       | Gleno-humeral joint stability<br>Lumbo-pelvic stability | Increased lumbar extension<br>Torso rotation<br>Lumbo-pelvic rotation  |

# The 7 screening tests

| <b>FMS test</b>  | <b>Purpose</b>  | <b>Required physical capacities</b>                                   | <b>Common dysfunctions</b>  |
|------------------|---|---|---|
| Rotary stability | Observes multi-planar movement patterns in the pelvis, trunk and scapular-thoracic region | Gleno-humeral joint stability<br>Lumbo-pelvic control<br>Hip mobility | Weight shifting<br>Increased lumbar extension<br>Reduced shoulder flexion |



# Scoring

Each test is graded through a 3 point scoring system. If a test is performed correctly, a score of 3 is given. A 2 is scored if there are compensations in the client's movement. A 1 is scored if the client is unable to perform the test. A zero is scored if the client feels pain when performing the test.

The score of each individual test is more important than the sum score of all 7 tests.

# Limitations of FMS

FMS does not predict acceleration, power or agility (lower body strength or power tests better for this). Additionally, further screening should be incorporated in order to fully understand a client's physical capacities.

FMS does not necessarily predict injury risk.

# The modified Landing Error Scoring System (LESS)

The LESS is a clinical screening tool that aims to assess an individual's risk of suffering a non-contact ACL injury through the evaluation of landing mechanics from a drop vertical jump. It is a good predictor of injury risk and has also been shown to 'show up' previous ACL injury.

The full test uses 2 video cameras (sagittal and frontal plane views) to analyse potentially high risk movement patterns that have been used as predictors of future ACL risk.

The modified test uses a subjective assessment of the client's landing mechanics in order to make the original test less time-consuming.

# LESS protocol

- Subject to drop-jump off a 30cm height box
  - Subject lands with heels on a line that is half of the subjects height from the foot of the 30cm box
  - Subject then jumps vertically into the air for maximal height
  - 3d motion analysis (or slow motion camera) is used to assess the kinematics of the movement
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- A video of the LESS test can be viewed [here](https://youtu.be/RjvcJtBtPYc)  
(<https://youtu.be/RjvcJtBtPYc>)
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- NB, a single leg landing can also be used where the subject has the appropriate strength for such a landing from a 30cm box

# The Landing Error Score Sheet

| Observing from front   | Observing from side  |
|--|--|
| <p>Stance width</p> <ul style="list-style-type: none"><li>• Normal (0)</li><li>• Wide (1)</li><li>• Narrow (1)</li></ul>   | <p>Initial landing of feet</p> <ul style="list-style-type: none"><li>• Toe to heel (0)</li><li>• Heel to toe (1)</li><li>• Flat feet (1)</li></ul> |
| <p>Maximum foot rotation position</p> <ul style="list-style-type: none"><li>• Normal (0)</li><li>• Moderately externally rotated (1)</li><li>• Slightly internally rotated (1)</li></ul> | <p>Amount of knee flexion displacement</p> <ul style="list-style-type: none"><li>• Large (0)</li><li>• Average (1)</li><li>• Small (2)</li></ul>   |
| <p>Initial foot contact</p> <ul style="list-style-type: none"><li>• Symmetric (0)</li><li>• Not symmetric (1)</li></ul>  | <p>Amount of trunk flexion displacement</p> <ul style="list-style-type: none"><li>• Large (0)</li><li>• Average (1)</li><li>• Small (2)</li></ul>  |

# The Landing Error Score Sheet cont.

| Observing from front   | Observing from side   |
|--|---|
| Maximum knee valgus angle <ul style="list-style-type: none"><li>• None (0)</li><li>• Small (1)</li><li>• Large (2)</li></ul>       | Total joint displacement in the sagittal plane <ul style="list-style-type: none"><li>• Soft (0)</li><li>• Average (1)</li><li>• Stiff (2)</li></ul> |
| Amount of trunk lateral flexion <ul style="list-style-type: none"><li>• None (0)</li><li>• Small (1)</li><li>• Large (2)</li></ul> | Overall impression <ul style="list-style-type: none"><li>• Excellent (0)</li><li>• Average (1)</li><li>• Poor (2)</li></ul>                         |
| Total =  |   |

# Operational definitions for the LESS

| LESS criteria                 | Operational definition  | Assessor view |
|-------------------------------|---|---------------|
| Stance width                  | Abnormally wide or narrow stance during landing, they receive an error (1)  | Front         |
| Foot-rotation position        | Moderate amount of external rotation or internal rotation, they receive an error (1)  | Front         |
| Initial foot contact symmetry | If 1 foot lands before the other or there is alternating heel-to-toe/toe-to-heel landing mechanics, they receive an error (1) | Front         |
| Knee valgus                   | Small amount of knee valgus (1)<br>Large amount of knee valgus (2)  | Front         |
| Lateral trunk flexion         | If trunk is not perfectly vertical in frontal plane, they receive an error (1)  | Front         |

# Operational definitions for the LESS

| LESS criteria                              | Operational definition  | Assessor view |
|--|---|---------------|
| Initial landing of feet                    | If subject lands heel-to-toe or flat footed they receive an error (1)   | Side          |
| Amount of knee flexion                     | Small amount of knee flexion displacement (1)<br>Average amount of knee flexion displacement (2)  | Side          |
| Amount of trunk flexion                    | Small amount of trunk flexion displacement (1)<br>Average amount of trunk flexion displacement (2)  | Side          |
| Total joint displacement in sagittal plane | Large displacement of trunk and knees = 'soft' (0)<br>Average displacement of trunk and knees = 'average' (1)<br>Small displacement of trunk and knees = 'stiff' (2)                    | Side          |
| Overall impression                         | Soft landing with no frontal plane motion at the knee = 'excellent' (0)<br>Stiff landing with large frontal plane motion at the knee = 'poor' (2)<br>All other criteria = 'average' (1) | N/A           |



# Scoring

The modified LESS is graded on a 10 point grading criteria. (maximum score is 16)

A score of 4 or less = excellent

A score of more than 6 = poor

# Limitations of LESS

LESS only analyses bilateral movement – yet injuries occur in a multitude of ways (cutting, side-stepping, reacting etc).

# References

‘Assessing movement through a variety of screening tests’. Chris Bishop, Paul Read, Scott Walker, Anthony Turner (UKSCA publication, 2015)