

MODULE BIOMECHANICS OF SPINE

Didactic Unit D: INSTRUMENTED ANALYSIS OF THE SPINE

D.5. How do I interpret a biomechanical instrumented analysis report in a case of spinal pathology?

CLASS ACTIVITY: *Biomechanical assessment of lumbar pathology*

Lumbar case: 47-year old man.

Profession: Welder.

Medical record: Previous low back pain events.

Clinical picture resulting in sick leave: Low back pain after efforts in the workplace.

Diagnostic tests performed and their results: The previous lumbar NMR showed degenerative disc disease at L4-L5 and disc herniation at L5-S1 lateralized to the left with possible involvement of the S1 root.

Treatment prescribed: Rehabilitation.

Progress: In the first consultation, the patient reported pain and limited movements of the lumbar spine.

Physical examination: At the beginning, the mobility of the lumbar spine was 45° for the lumbar flexion and 5° for extension. He reported pain during lumbar extension and on palpation of the lumbar spinous processes and right sacroiliac joint. Bilaterally negative Lasègue's sign.

Because of the limitation of the patient's lumbar mobility, two biomechanical lumbar assessment tests were performed by the mutual insurance company during the monitoring of his sick leave. The first assessment, performed after 17 days of sick leave, shows a pattern of mild functional limitation. Given this objectified limitation and the signs found in the physical examination, the patient continues the rehabilitation programmes, showing a clear improvement in a second evaluation 7 weeks after the sick leave.



Results of the biomechanical assessment test

1. Results of the lumbar assessment after 17 days of sick leave

The graphs representing the movement performed by the patient are shown below, together with the graphs of a normal movement (a person without pain or lumbar pathology, whose characteristics are similar to those of the patient) so that you can compare them.

Time, in seconds, needed to perform the recorded movements:

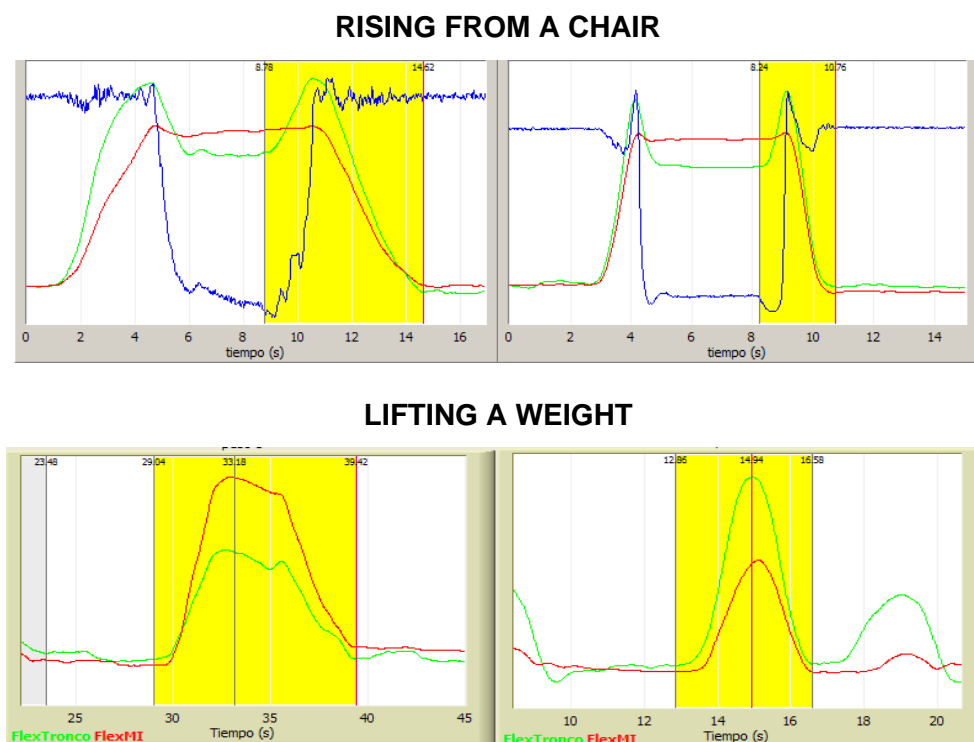


Figure 1. The yellow stripe represents the total time in seconds (abscissa axis) needed to completely perform the movement. The image on the left shows the patient's record, whereas that on the right shows a person without pathology or pain.

With regard to the **speed and acceleration of the movement in these two activities:**

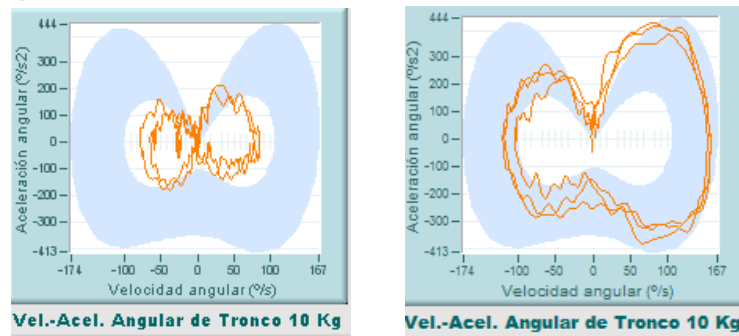


Figure 2. Representation of the angular speed/acceleration of the trunk for the three repetitions of the movement of lifting 10 kg, along with the normality bands (blue band). The image on the left shows the patient's record, and that on the right, the record of a person without pathology or pain.

Regarding the **vertical reaction force:**

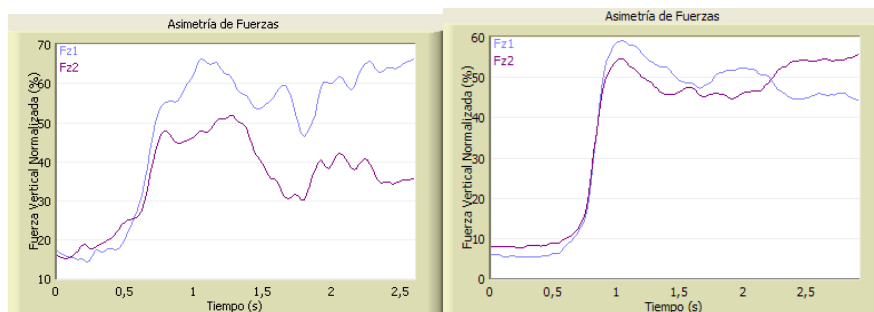


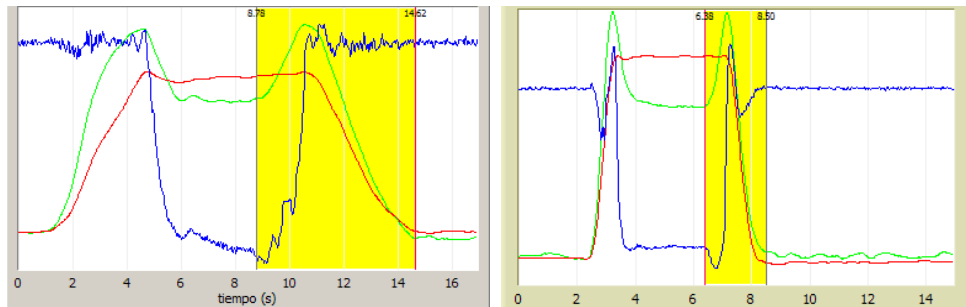
Figure 3. Total normalised vertical force performed by the right foot (Fz1) and by the left foot (Fz2) while performing the sit-to-stand movement in one of the repetitions. The image on the left shows the record of the patient who was assessed, whereas the image on the right shows a person without pathology or pain.

2. Results of the biomechanical assessment of activities in subsequent monitoring

The graphs below represent the movement performed by the patient. **This information is completed by the graphs from the previous session** so that it is easier for you to compare them.

Time, in seconds, needed to perform the movements recorded.

ACTIVITY: RISING FROM A CHAIR



ACTIVITY: LIFTING A WEIGHT

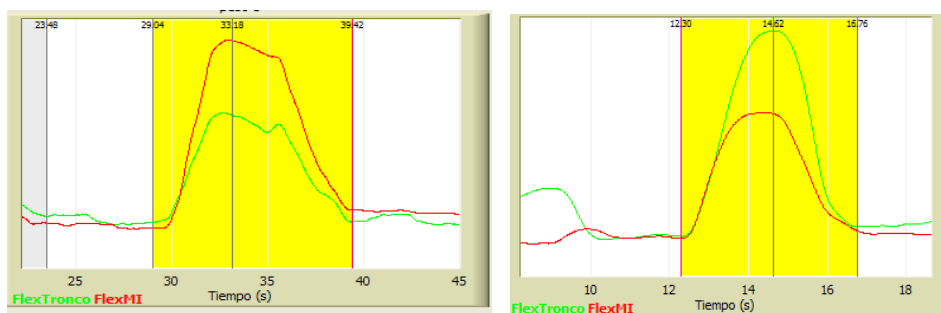


Figure 4. The yellow stripe represents the total time in seconds (abscissa axis) needed to completely perform the movements. The image on the left shows the record of the patient in the previous session (functional alteration), and the image on the right, the same patient during the current assessment session.

With regard to the **speed and acceleration of the movement in these two activities:**

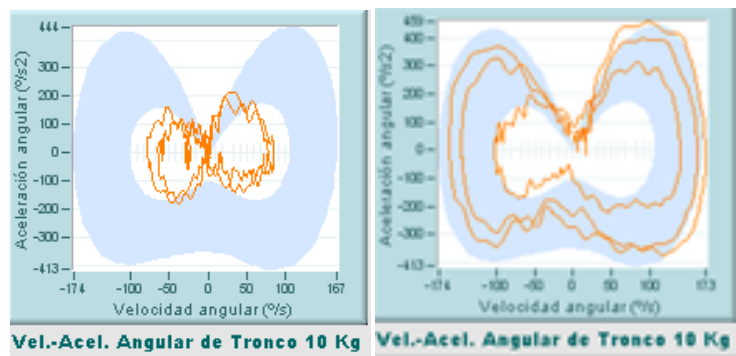


Figure 5. Representation of the angular speed/acceleration of the trunk for the three repetitions of the movement performed by the patient to lift 10 kg, along with its normality bands. The image on the left shows the patient's record from the previous session, and the image on the right, the same patient during the current session.

With regard to the **vertical reaction force** recorded with two dynamometric platforms:

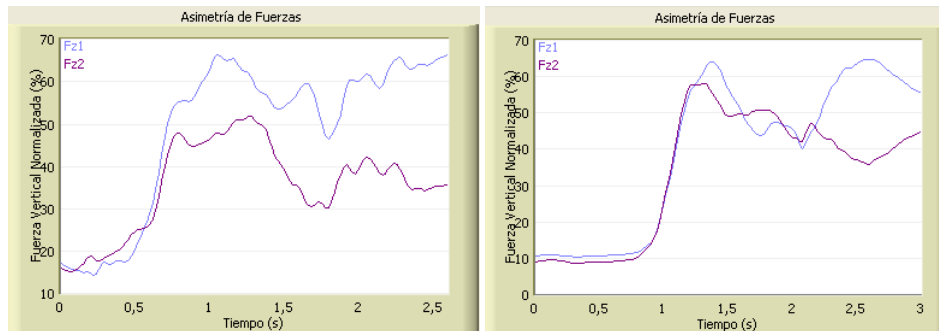


Figure 6. Total normalised vertical force exerted by the right foot (Fz1) and by the left foot (Fz2) while performing the sit-to-stand movement in one of the repetitions. The image on the left shows the patient's record from the previous session, whereas the image on the right shows the same patient during the current session.

QUESTIONS

The student can answer these questions by themselves or in group, through software like Kahoot, or coloured cards (red for YES, green for NO, yellow for NOT SURE):

Do you observe an increase in the time needed to perform each activity assessed?

YES / NO / NOT SURE

Is there any element in the graphs representing the lifting that you can associate with difficulty in performing such movement? Why? (Discuss with the teacher)

YES / NO / NOT SURE

Do you think that the speed of movement of the trunk is fast and corresponds to normal motion?

YES / NO / NOT SURE

Can you find any asymmetry in the support while performing the activity?

YES / NO / NOT SURE

Has the patient improved compared to the previous session? Why? (Discuss with the teacher)

YES / NO / NOT SURE

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