Erasmus+

Development of innovative training solutions in the field of functional evaluation aimed at updating of the curricula of health sciences schools

MODULE BIOMECHANICS FOUNDATIONS

Didactic Unit F: REQUIREMENTS OF A BIOMECHANICAL ASSESSMENT SYSTEM. CONCEPTS OF VALIDITY, RELIABILITY AND ACCURACY

F1. What features should an appropriate biomechanical assessment system count on?

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OBJECTIVES

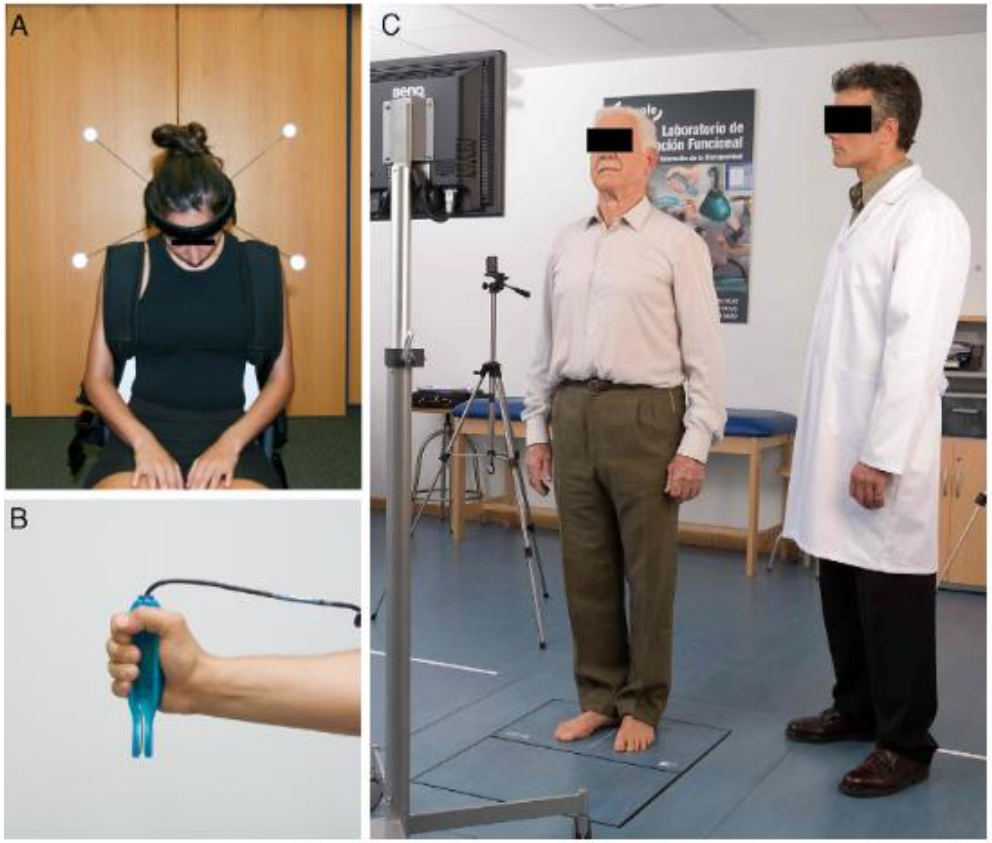
1. Explain what is a biomechanical assessment test and its main applications in different contexts.
2. Briefly introduce its main requirements: VALIDITY, RELIABILITY and USABILITY.

CLASS DEVELOPMENT

10’	Biomechanical assessment test in different contexts
10’	Exercise1: Look for new examples
5’	Requirements for biomechanical tests and exercise 2: good and bad examples.
5’	Key ideas and lessons learned.

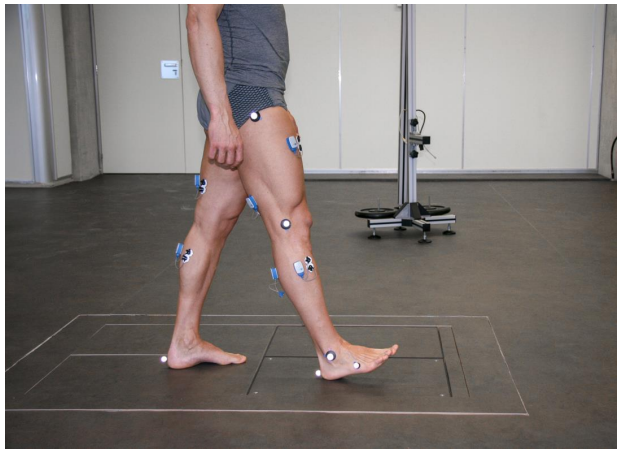
Biomechanical assessment tests in different contexts

What a biomechanical test is



Images corresponding to different biomechanical assessment tests. Cervical motion analysis with fotogrametry (A), hand grip strength analysis with a hand dynamometer and posturographic assessment with force platform (C), respectively

What a biomechanical test is



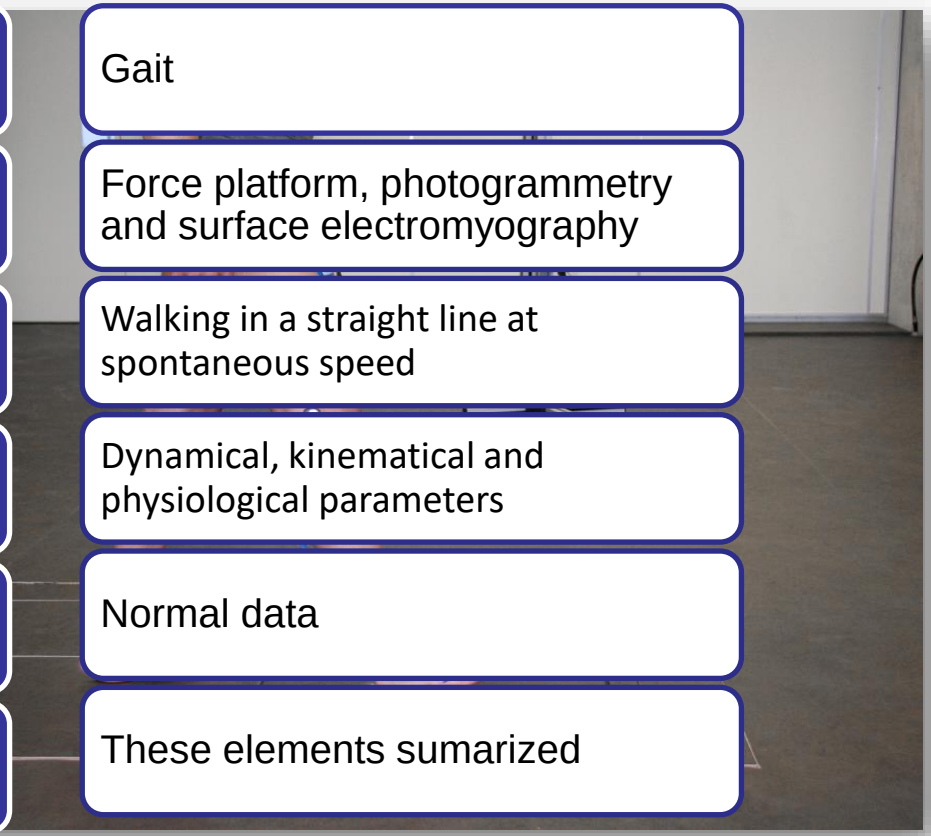
Images corresponding to different biomechanical assessment tests. lifting of loads for assessment of the lumbar spine or gait assessment

Elements in a biomechanical assessment test

- Function, activity or gesture subject to assessment.
- Instrumental technique it is based on.
- Protocol
- Results
- Criteria for interpretation.
- Report

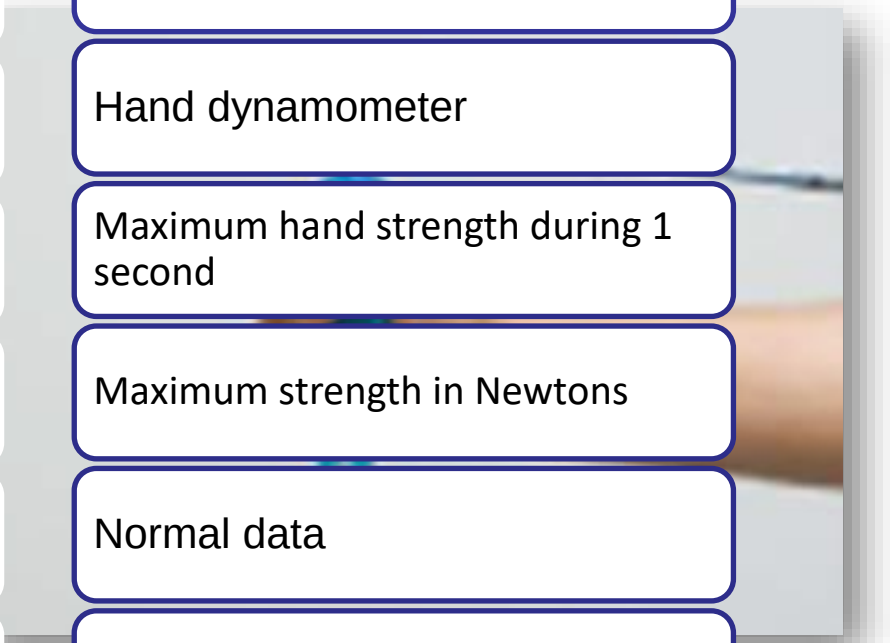
Elements in a biomechanical assessment test

Function, activity or gesture subject to assessment.	Gait
Instrumental technique it is based on.	Force platform, photogrammetry and surface electromyography
Protocol	Walking in a straight line at spontaneous speed
Results	Dynamical, kinematical and physiological parameters
Criteria for interpretation.	Normal data
Report	These elements sumarized

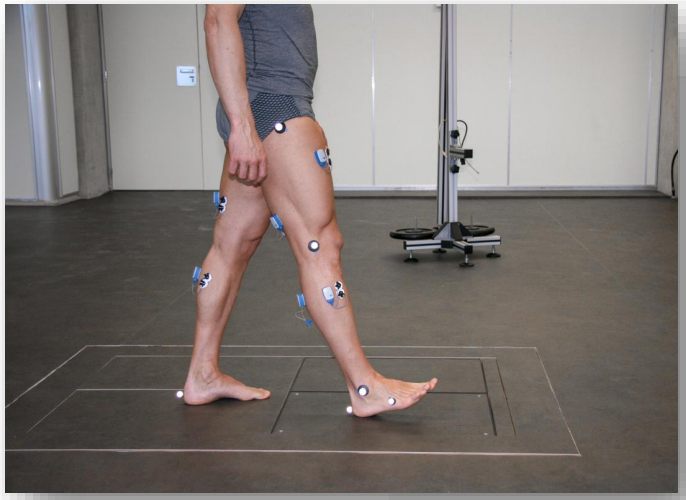


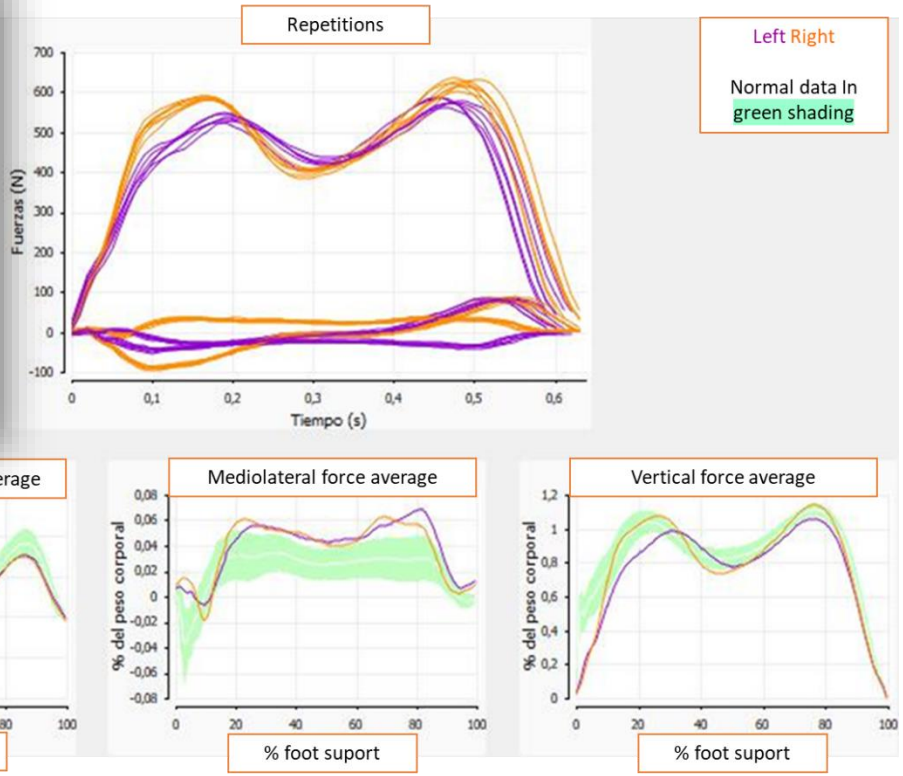
Elements in a biomechanical assessment test

Function, activity or gesture subject to assessment.	Hand strength
Instrumental technique it is based on.	Hand dynamometer
Protocol	Maximum hand strength during 1 second
Results	Maximum strength in Newtons
Criteria for interpretation.	Normal data
Report	These elements sumarized



Elements in a biomechanical assessment test





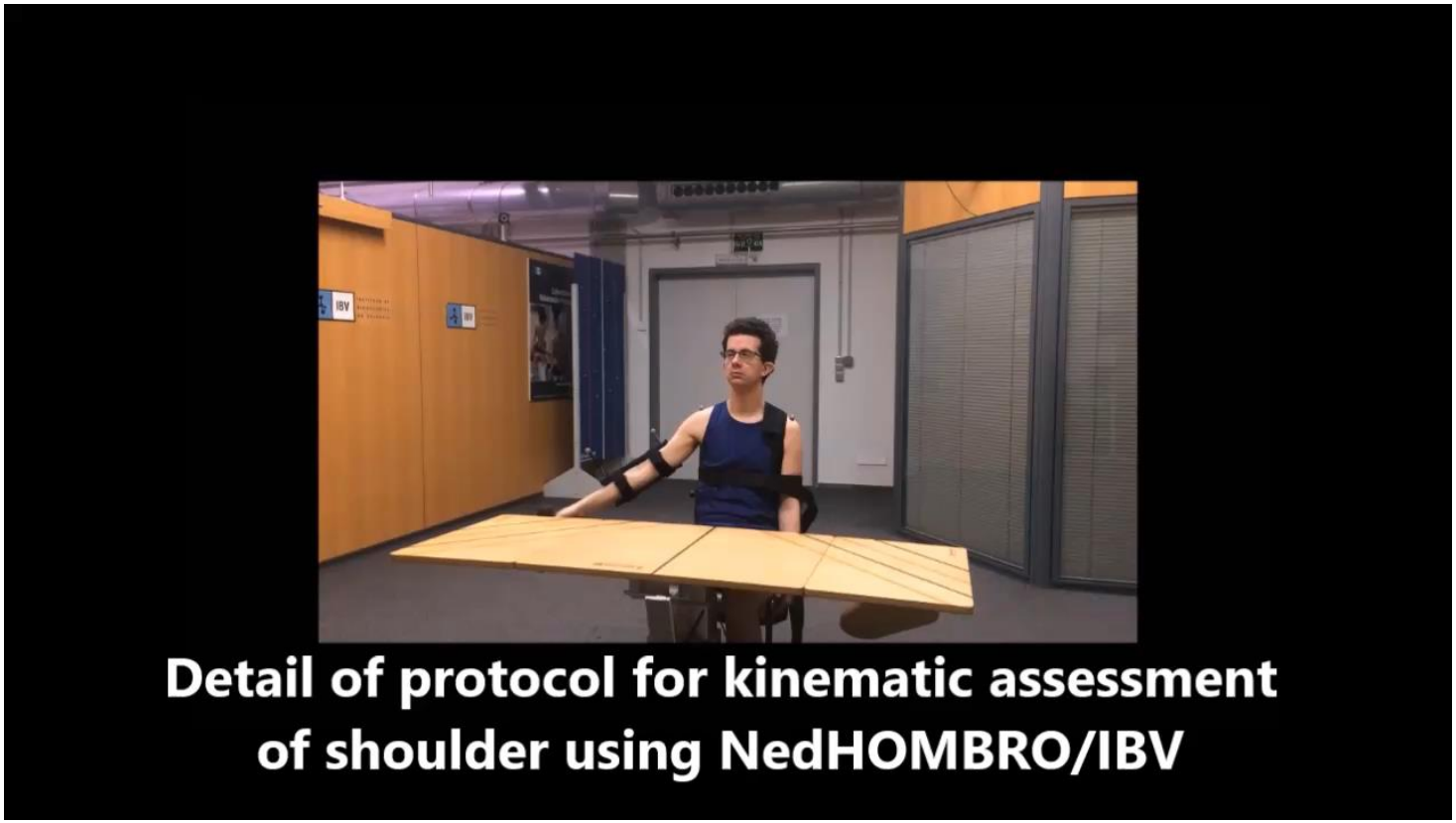
Common biomechanical tests in the clinical context

- Assessment of activities of daily living
- Balance function assessment
- Assessment of mobility in upper, lower and spinal limbs
- Strength assessment in upper, lower and spinal limbs

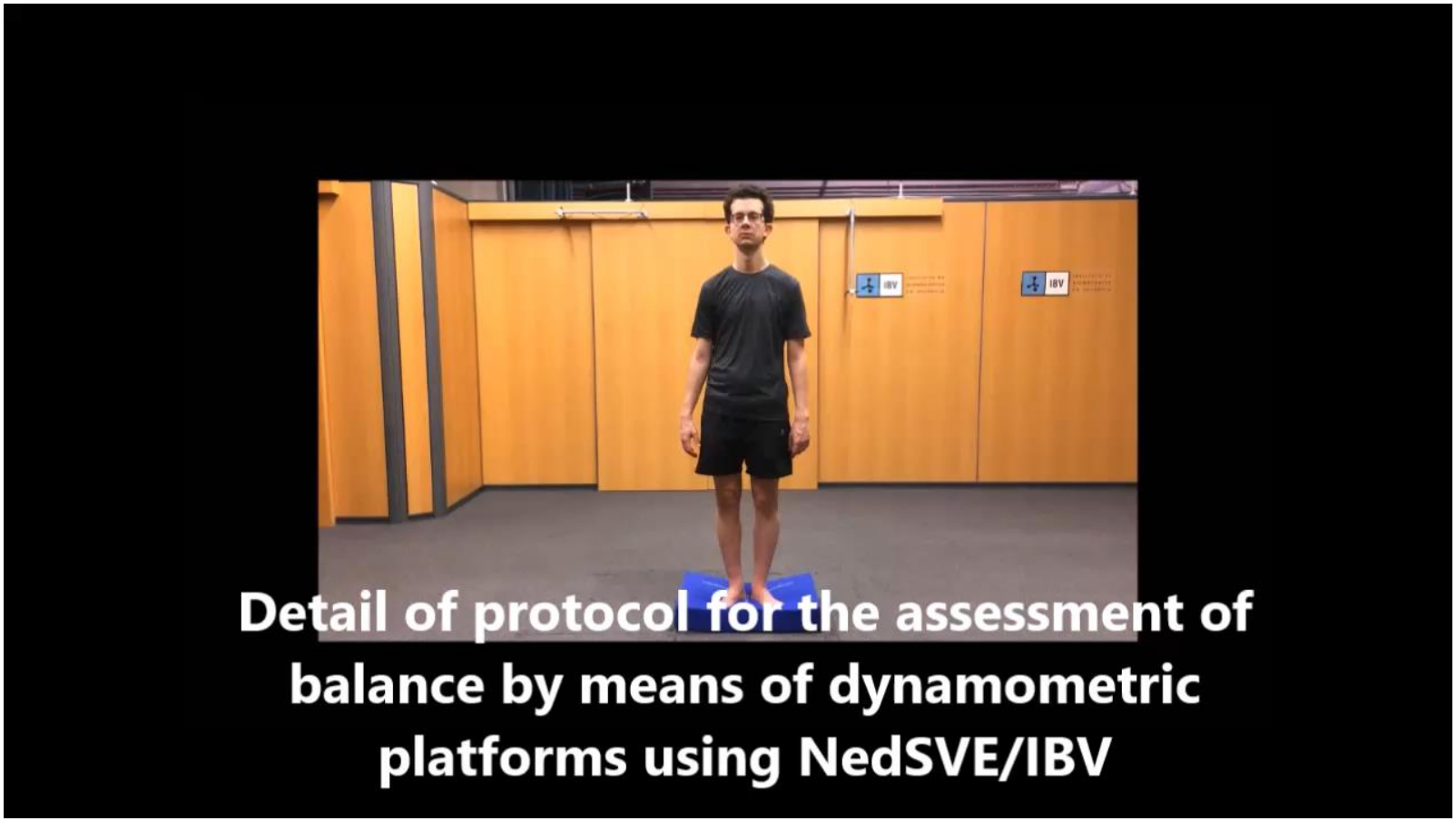
Assessment of activities of daily living: Dynamic gait assessment

Assessment of activities of daily living: Dynamic and kinematic assessment of rising from a chair

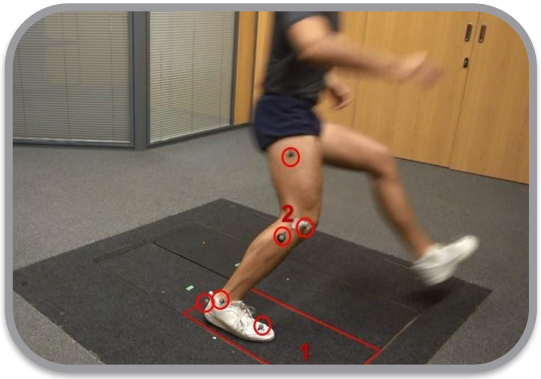
Assessment of activities of daily living: Kinematic assessment of shoulder while lifting a weight



Balance function assessment using force plates

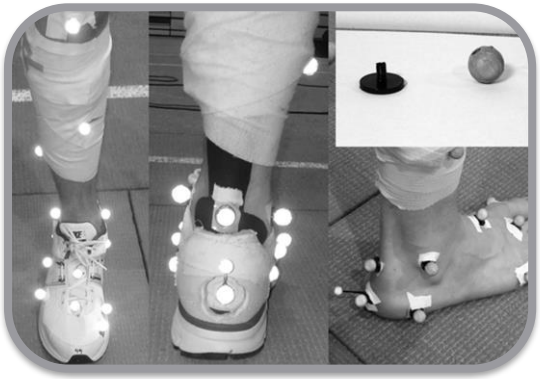


Common biomechanical tests in other contexts



Sportive

Ergonomic



Investigation

Biomechanical assessment tests in different contexts. Let´s look for examples.

Requirements of biomechanical tests

Requirements of biomechanical tests

- Validity
- Reliability
- Usability

We will try to understand these three concepts with bad and good examples.

Grip strength assessment with a thermometer?

If you use a thermometer for grip strength assessment…

Are you performing a **reliable** measurement?

Are you performing a **valid** measurement?

Grip strength assessment with a hand dynamometer?

If you use a hand dynamometer for grip strength assessment…

Are you performing a **reliable** measurement?

Are you performing a **valid** measurement?

Are you performing a **usable** measurement?

KEY IDEAS I

- A biomechanical assessment test is a complementary test done by means of biomechanical techniques and it should be used in different contexts.
- There are different biomechanical assessment tests, the elements that determine them are:
  - What function, activity or gesture is subject to assessment.
  - What instrumental technique it is based on.
  - What assessment protocol has been used.
  - What results it provides, in what units and with what data analysis techniques have been obtained.
  - Existence of standardized criteria for interpretation.

KEY IDEAS II

- There is some heterogeneity regarding the procedures used, despite this fact, functional evaluation with biomechanical tests is widespread in the clinical field. The most widely used biomechanical tests in the clinical context, classified according to their purpose of assessment and instrumental technique, are:
  - Assessment of activities of daily living.
  - Balance function assessment.
  - Assessment of mobility in upper, lower and spinal limbs.
  - Strength assessment in upper, lower and spinal limbs.
- Biomechanical tests are also used in sportive, ergonomic or investigation contexts.
- The fundamental criteria that must be met by biomechanical assessment techniques are validity, reliability and usability..

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