

# A new functional test for the evaluation of the erector muscles of the spine: the Back Extensor Test (BET)



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## Why a new test?

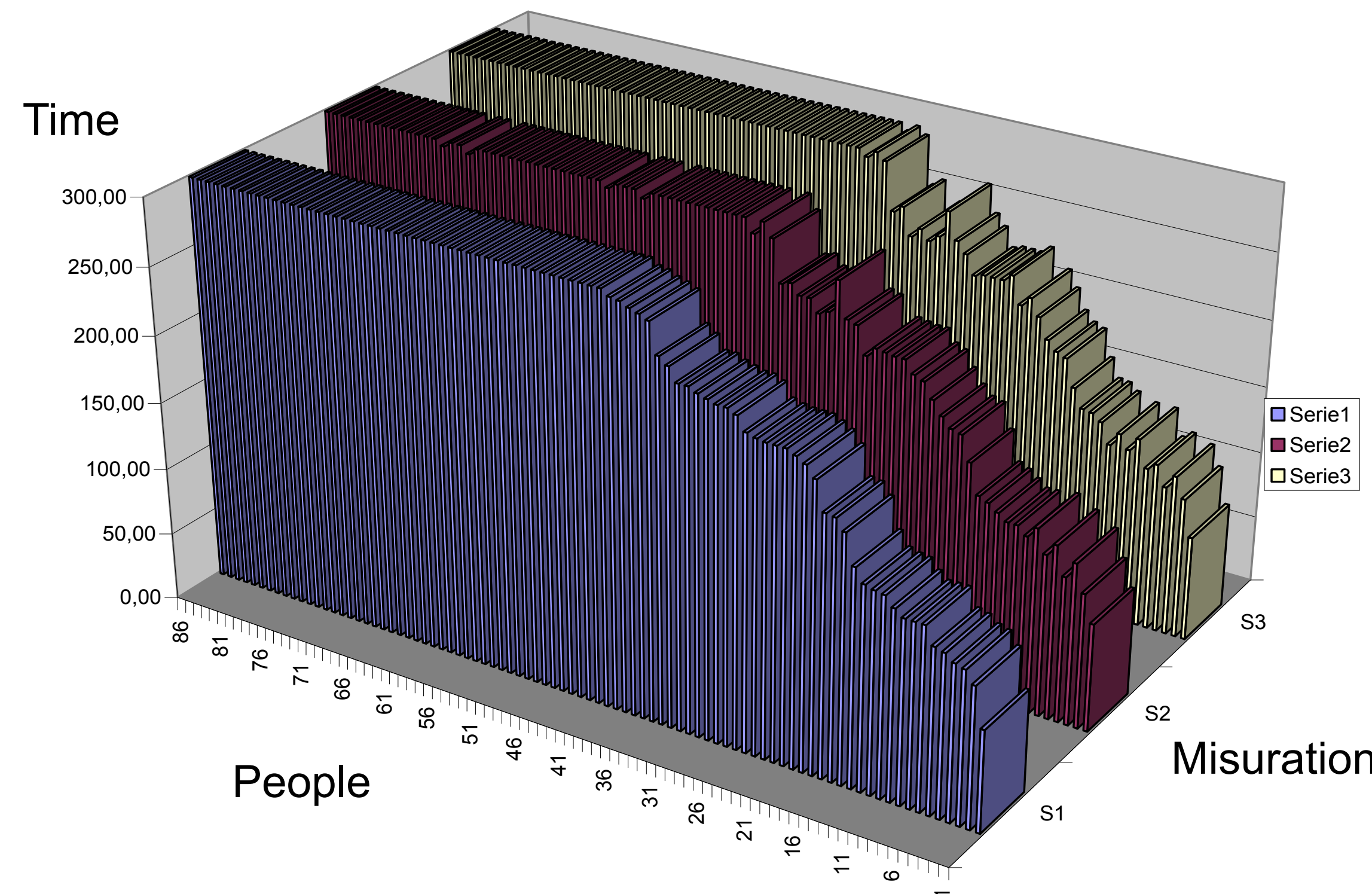
The biomechanics of the spine leads us to think that a low efficiency of the erector muscles (EM) produces an overload on the vertebral body. In the literature, the relationship between BMD and muscle strength has been shown<sup>1-2</sup> but there are no reliable data concerning the relationship between trunk muscles and vertebral fractures in osteoporotic patients.<sup>3</sup>

In a lot of studies reduced back muscle endurance has been identified as a potential personal risk factor for developing chronic low back pain (CLBP).<sup>7</sup> The most widely studied test in the literature is the Soerensen test, but there are doubts about the exclusive involvement of the EM and there is serious hazard when applied in patients with osteoporosis.<sup>4-5</sup>

The tests with instrumental dynamometers are very accurate but, there is no common protocol for implementation<sup>6</sup> and their costs are very expensive.

## Validation studies: reproducibility

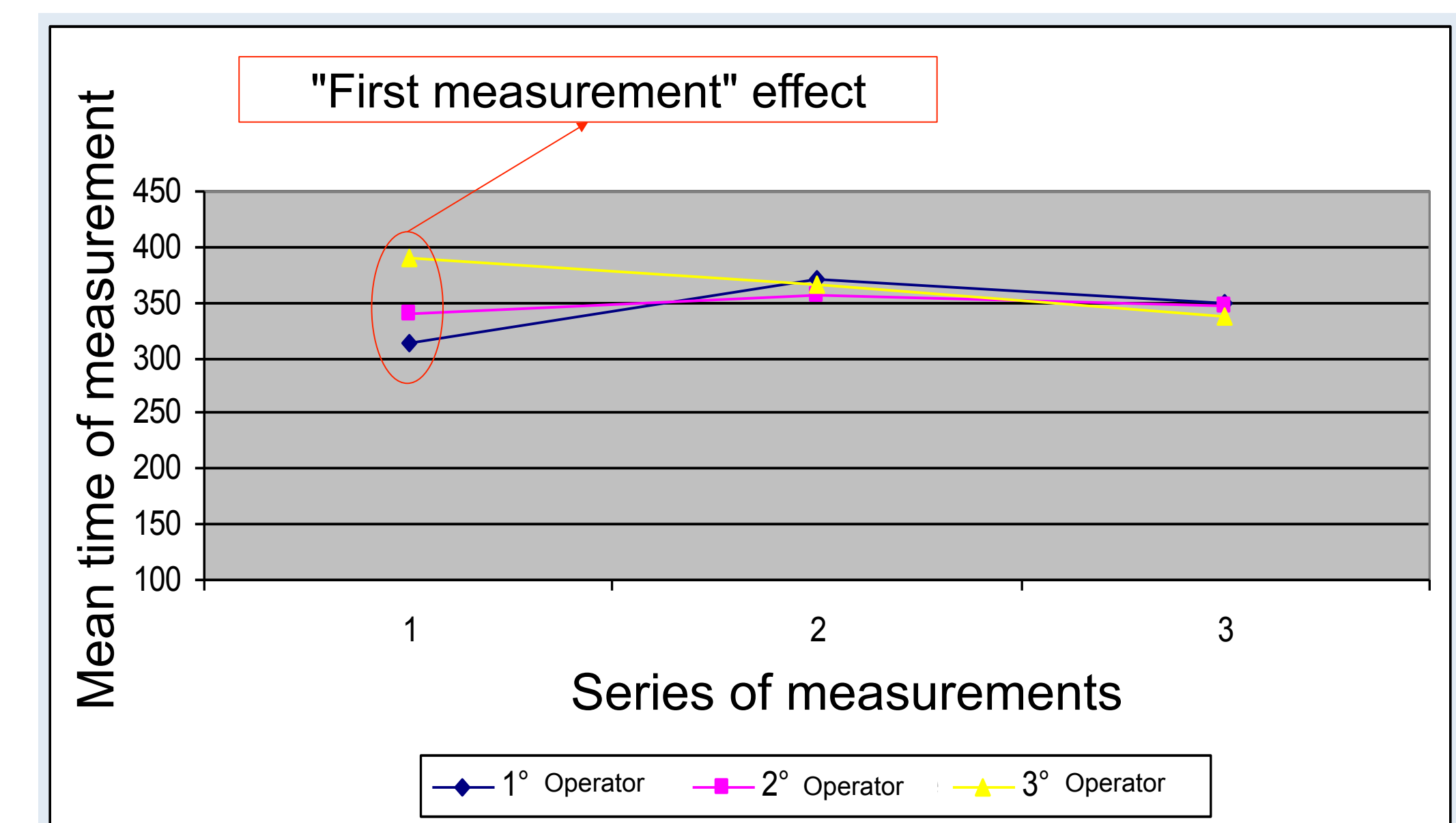
### Intra-subject and intra-operator



Considering all the tests performed, the average standard deviation is 8,38 sec and the index of variation is 3.73, the reproducibility is good.

### Inter-operator

Although the results are encouraging, the inter operator repeatability has not been fully confirmed yet. There were problems about: **"First measurement"** effect, poor compliance of volunteers, poor **training** of tester, test conditions often not adequate.



## The BET

Free position of the head Fully extended trunk 45° hip flexion



Hands crossed and laid on shoulders, arms next to the body ("pharaoh position")

Flexion of the knees 10° maximum to detend posterior thigh muscles

Feet in external rotation and at the same distance of shoulders

We measured the time in seconds  
**The test STOP when appear:**

- lumbar pain
- fatigue
- movements of the trunk more than 5-10° or after
  - 300 sec in clinical application
  - 600 sec in training trials

The investigated subjects were 229 volunteers selected among S.Paolo Hospital Volunteers, S. Paolo Osteoporosis Clinic patients, among the students of Medicine, Physiotherapy, and Nursing Faculty of the Milano University. They were divided in three groups according to their story:

healthy, CLBP, Osteoporotic.

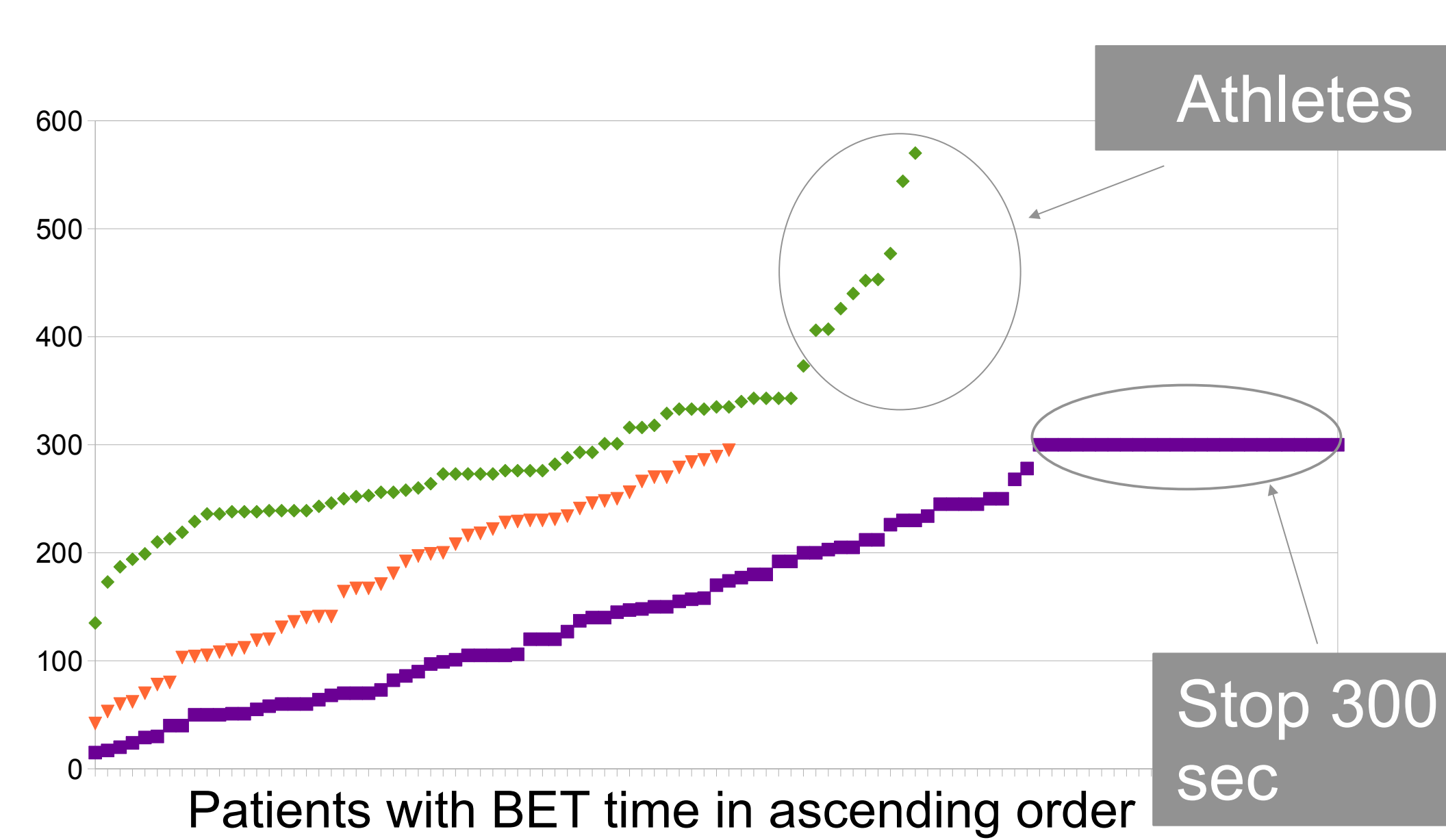
Athletes (98) were recruited in several sports club (basket, football, rugby) and divided in two groups: healthy and LBP.

The statistical analysis used the ANOVA (analysis of variance on multiple criteria classification for repeated measures) through the software SPSS version 20.0 (SPSS INC., USA).

The analysis of paired variables results (ultrasound group) was based on Student's.

## Validation studies: sensibility e specificity

### Osteoporosis e CLBP



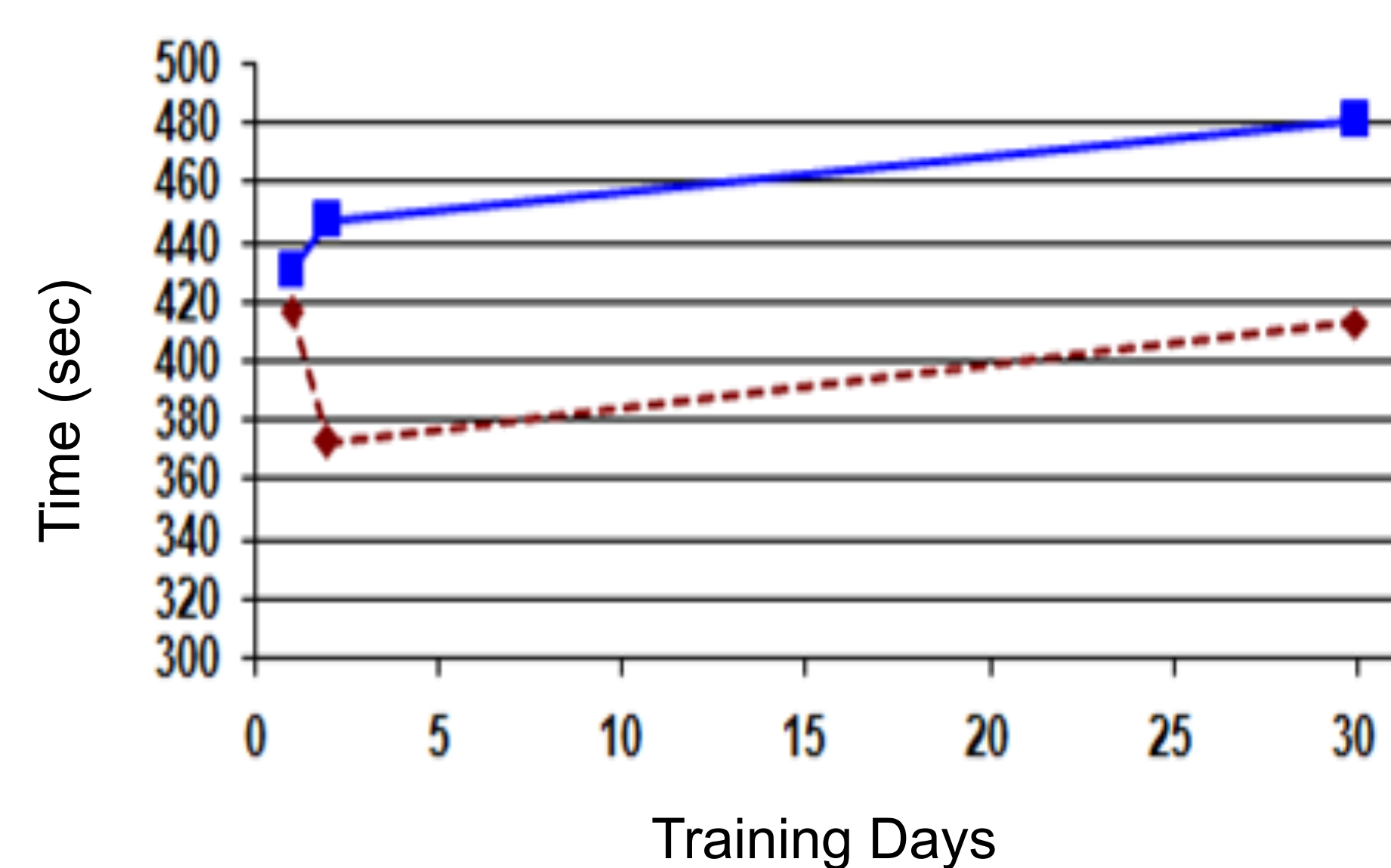
The difference time between BET in healthy patients (green) and those with low back pain (orange) or osteoporosis (purple) is statistically significant ( $p < 0.05$ ).

### Physiotherapy

	BET 1	BET 2	VAS 1	VAS 2	OS 1	OS 2	ST 1	ST 2
BET 1		0,001	0,001	0,001	0,001	0,001	0.354	0.45
BET 2			0.025	0.05	0.01	0,001	0.493	0.49

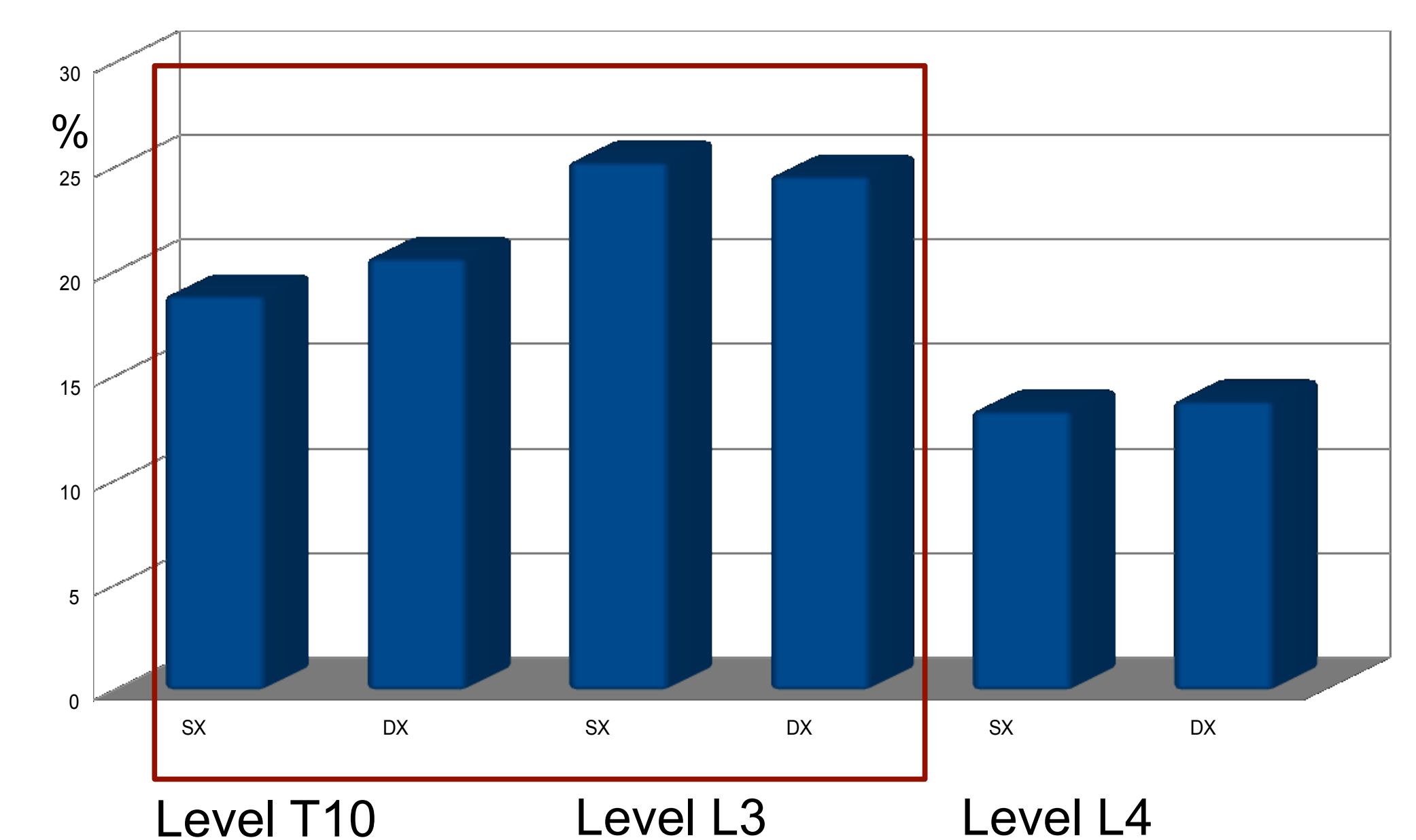
Patients with low back pain assessed with BET, Shober, Oswestry and VAS before and after a course of 10 sessions of physiotherapy: we find a very strong correlation between VAS and BET; if the pain decreases increases the efficiency of the muscles of the spine.

### Sport



The BET correlates statistically with the athletic training in different sports especially in athletes > 30 years ( $p = 0.0366$ )

### Echography



Statistically significant correlation between time of BET and changes in the lumbar multifidus (L3 and L4 above) before and after 1 min of BET ( $p < 0.001$ ).

## Conclusion

The BET has shown an excellent potential in the study of the musculature of the spine for the evaluation of athletic preparation, the effectiveness of physiotherapy treatments, for the detection of the osteoporotic and low back pain patients.

The BET could be useful in assessing the risk of vertebral fractures in osteoporosis (because a deficiency of the extensors is an important cofactor in the determinism of a compression fracture).

To ameliorate the data about its specificity a study on its correlation with electromyographic is on going. The data about the interoperator reproducibility have to be implemented resolving the emerged BIAS.

## References

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