Validity of the Myotest® during the bench press: Preliminary results

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Introduction

In order to explore validity, we compared the measurements provided by the Myotest® with measurements from another recognized isoinertial dynamometer (Jidovtseff et al., 2006) obtained from a dynamic bench press test. Analysis of the results was carried out in two parts – on the one hand the correlations that occur between the results recorded by each measuring system are evaluated, and on the other hand the Myotest®'s ability to detect minor performance modifications between attempts using different weights was investigated.

Experimental procedure

14 subjects (5 girls and 9 boys), all of whom study physical education and exhibit no injuries to the lower limbs, took part in the bench press isoinertial evaluation procedure.
Following a brief familiarization session to determine 1RM, the subjects carried out the same tests three times within the space of one week. The weights used, the number of attempts and the recovery time permitted are listed in table 1.

Familiarization	**Session tests 1 – 2 – 3**			
• Determination of the position • Familiarization • Determination of 1RM	*Weights (% 1RM)*	*Method*	*Attempt*	*Recovery*
	30%	Concentric	4	1'
	30%	With projection	4	1'
	50%	Concentric	3	1'
	70%	Concentric	2	3'
	95%	Concentric	2	3'

Table 1 – Experimental procedure

In all of the tests, the performances were measured using the Myotest® and the isoinertial dynamometer developed at the University of Liège (ULg) by combining an accelerometer and a displacement sensor. The parameters used in our analysis are as follows:

- Time : Total time to lift the bar
- Dmax : Maximum bar displacement
- Pmax : Maximum power during the bench press
- Pave : Average power during the entire lifting phase of the bar
- Vmax : Maximum bar velocity
- Vave : Average velocity during the entire lifting phase of the bar

Preliminary results
The preliminary results involve 152 tests collected from 7 of the 14 subjects.
Initially, we studied the correlations that exist between the parameters measured by the two dynamometers (Myotest® and Ulg) during the same test.

The time taken to lift the bar is perfectly correlated by the two dynamometers ($r = 0.997$). The correlations were very high for Pmax, Vmax and Vave ($0.955<r<0.994$). However, the correlations do decrease for Pave ($r = 0.94$) and displacement ($r = 0.86$).

The measurements observed for the first three loads (30, 50 and 70% of 1RM) appear to be in a straight line. All of the measurements carried out to 95% demonstrate a linear decline that is determined by the weights.

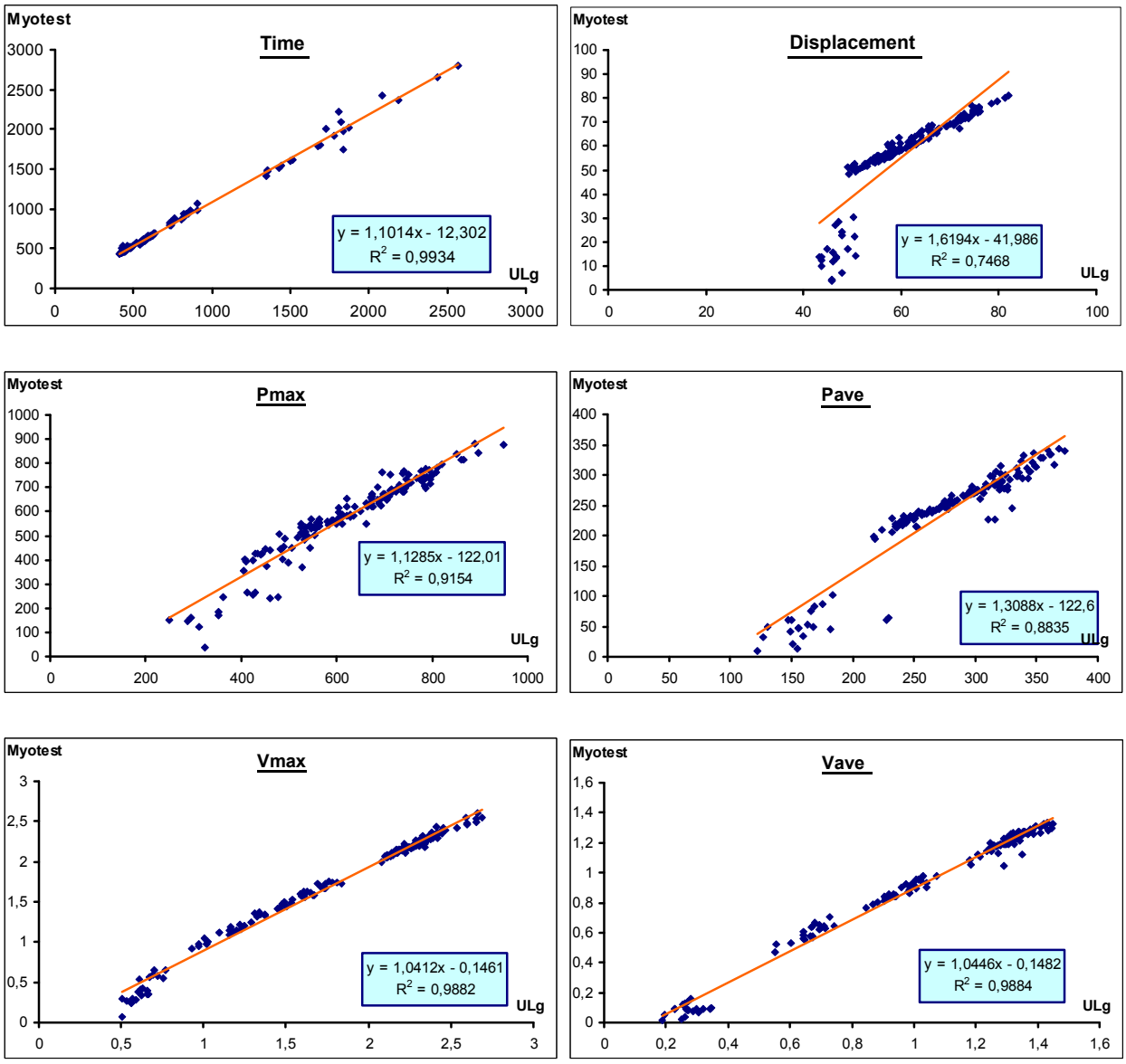
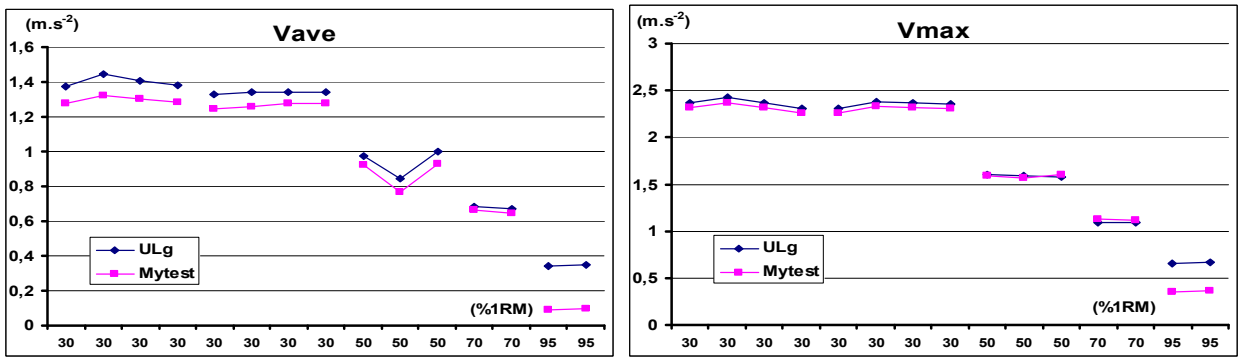


Figure 1 – Correlations between the measurements observed by the two dynamometers for the main parameters.

Equally interesting is a comparison of the measurements of each dynamometer when a subject carries out the bench press test.



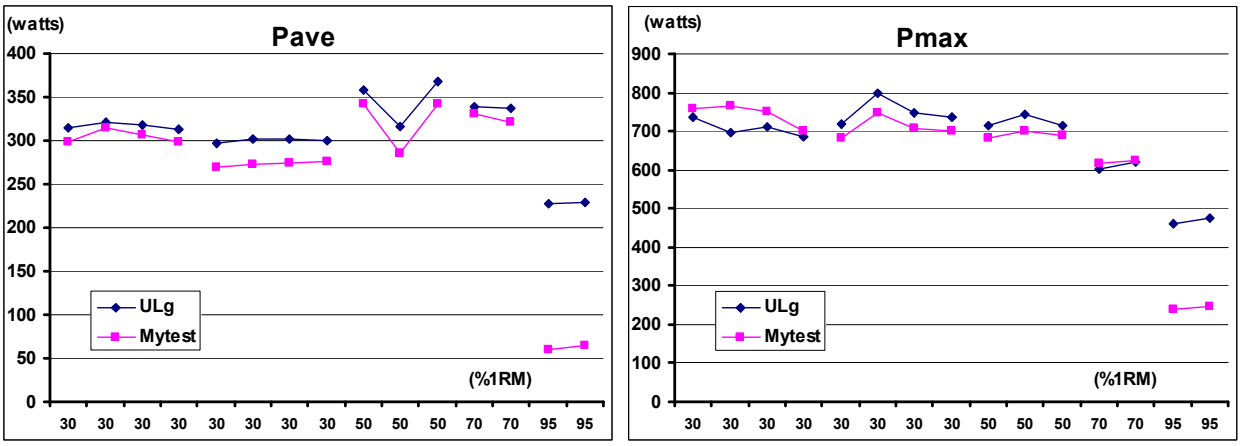


Figure 2 – Performances measured by the dynamometers with a subject lifting different weights during a single session.

Clear parallels between the power (Pave and Pmax) and velocity (Vave and Vmax) measurements can be observed among the results received from the two dynamometers.
The average values provided by Myotest® appear to be slightly lower. At 95% of 1RM on the other hand, the results provided by the two measuring systems prove to be very different.

Interpretations and conclusions

This collection of preliminary results shows that the Myotest® provides valid values during the first three loads (30, 50 and 70% of 1RM). The parallel observed by the ULg dynamometer also demonstrates that it is highly sensitive to minor variations in performance. This sensitivity remains a basic useful quality when trying to track the long-term effects and results of training. However, at 95% of 1Rm, the Myotest® appears to have reached the limits of its validity: The results no longer entirely match those obtained with the ULg dynamometer.

At this load, it is probably the case that the movement, being very slow and very long, is plagued by a parasitic signal that favors an accumulation of errors, and thus has a direct chain-reaction effect on the velocity and power measurements. The error could stem from the procedure used to calculate the two scales. We were in fact able to correct most of the data drift by going back to the accelerometer's original signal. Within the scope of this type of procedure, this observation leads us to believe that an improvement in the data analysis process would increase the validity of the Myotest® measurements across all loads.

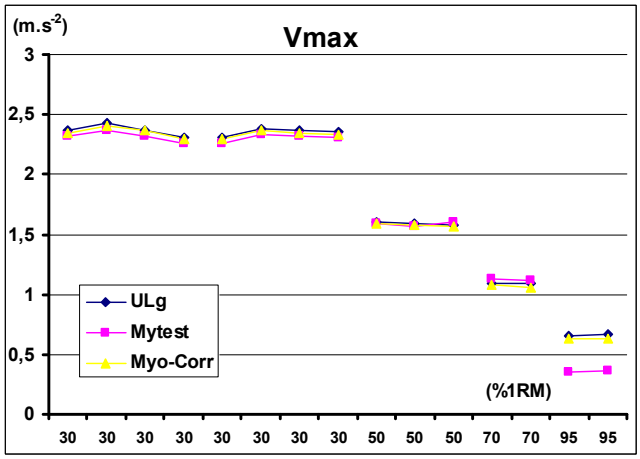


Figure 3 – The yellow curve represents the Vmax recalculated for each load based on the gross acceleration data of the Myotest®

Reference

Jidovtseff et al. – The concept of iso-inertial assessment: Reproducibility analysis and descriptive data. Isokinetics Exerc Sci, 14, 53-62, 2006.