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Why we developed the 400S Force Plate to accurately measure human performance

It is an established scientific fact that all displacement measurement devices like Linear Position Transducers (LPT) & Rotary Encoders (RE) regardless of make or model, all can only accurately measure distance and speed of movement of the object to which they are attached. The most common application is to measure barbell movement in the vertical plane and displacement and velocity can be determined accurately and reliably only if there is limited movement in the other two planes. However, using this data to predict acceleration, force, impulse and power involves numerous assumptions resulting in values which are simply not valid.

The critical measurement in any performance is the force applied and the characteristics of force application with time. That is, impulse and rate of force development. Force, impulse and rate of force development can only be measured validly using force transducers at the point of application. That is why we recommend force platforms as the gold standard for assessing human performance in any tests of strength or ballistic capacity. Several systems including our own Ballistic Measurement System software via a LPT & all other makes on the market including Rotary Encoders (RE) models, all make estimates of force, impulse and even power output based on only the use of displacement data and mass being moved. However, numerous research papers (* refer references below,) have demonstrated that this technique significantly over or under estimate the actual performance. One of the greatest issues is that displacement measurement systems track movement in a single plane and of a single point. For example, in a back squat tracking displacement of the barbell and movement in the horizontal plane will generate errors and it is well established that the barbell movement is not a representative of movement of the system (barbell plus lifter's centre of mass.) Any attempt to use this displacement data to estimate force, rate of force development, impulse or power applied to the ground, which is the critical performance criteria, is not biomechanically correct and will always provide erroneous results.

In most professional sports accurate force, impulse, rate of force development and power measurement is required for valid assessment of athletes' performance qualities, development and evaluation of training programs. This must be done in real time using direct force measurement rather than extrapolation from measurement of displacement.

This is why only Fitness Technology provides the more advanced option that combines the optimal technique of direct measurement of ground reaction force (via our 400S Force Plate) with tracking of the barbell or athlete displacement (via our Linear Position Transducer) all integrated by our Ballistic Measurement System software. Only with this system is it possible to accurately measure & record the critical performance qualities of force, impulse, rate of force development and power in real time. All this is achieved using our Ballistic Measurement System (BMS) software via a USB Port connection to any PC running Windows XP, Vista or Windows 7 operating systems and fully integrated with Microsoft Excel.

- **Our 400S Force Plates + LPT units are all 100% powered via a PC USB Port! Both provide self calibration with validation functions via our BMS software. These critical functions are not available in other units out there on the market.**

* References

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