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The "SmartRow" sensor for the determination of key mechanical parameters in indoor rowing. A report on validity

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SUMMARY (excerpt)
Indoor rowing machines use a flywheel to temporarily store energy delivered by the rower during the stroke phase and some form of friction or damping to dissipate energy.

In many indoor rowing machines, mechanical work done by the rower is estimated from the kinematics of the flywheel. In such indirect methods, energetic effects of the acceleration/deceleration of the flywheel as well as frictional losses between the flywheel and the handle are often neglected.

In contrast, the recently developed SmartRow sensor (a replacement pulley, instrumented with microprocessors and calibrated sensors) is able to directly and precisely measure pulling forces and strokes lengths when installed on a WaterRower indoor rowing machine.

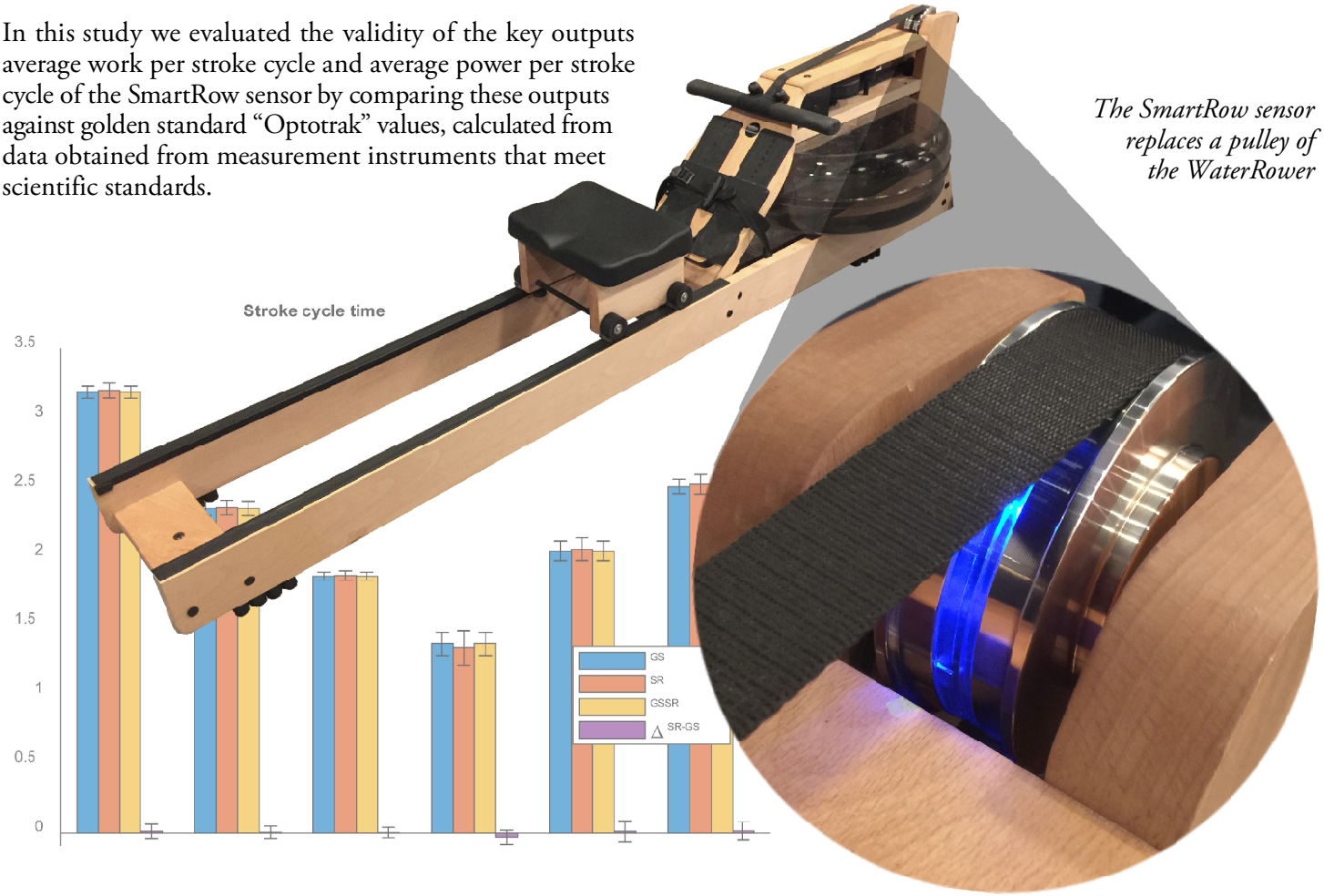
In this study we evaluated the validity of the key outputs average work per stroke cycle and average power per stroke cycle of the SmartRow sensor by comparing these outputs against golden standard "Optotrak" values, calculated from data obtained from measurement instruments that meet scientific standards.

The evaluation was carried out at room temperature for a single SmartRow sensor mounted on a WaterRower indoor rowing machine.

Two rowers – one recreational, one elite-level – performed six trials, each at different stroke rates, different intensities, and rowing styles, also including starts from standstill.

CONCLUSION
Steady state or acceleration, the SmartRow sensor in conjunction with the WaterRower successfully captures both elite and recreational rower's key performance variables in indoor rowing.

In sum, the SmartRow sensor provides all performance data relevant for indoor rowing in high quality, based on the direct measurement of force and displacement. As such, the SmartRow sensor is very well suited for use as a tool to monitor exercise intensity and effects of training.



The SmartRow sensor replaces a pulley of the WaterRower