

ROBERT WARNER, MS, CSCS, NSCA-CPT, TSAC-F, RSCC

INTRODUCTION

Tests and progress reports are integral parts of exercise participation. They provide a framework for strength and conditioning coaches to navigate athletes toward goals and optimized performance. However, testing can be intrusive and come with associated risks. For example, the American College of Sports Medicine (ACSM) recommends that graded exercise tests, such as the Bruce protocol, be performed sparingly (5). This is recommended because graded exercise tests can induce adverse health effects and undesirable fatigue (4,5). Repetition-maximum assessments commonly used in strength and conditioning settings also induce high stress and fatigue. Furthermore, periodization schemes, skill acquisition, and safety must all be considered when conducting such assessments (2,7). This poses a dilemma for strength and conditioning coaches who want to mitigate stress while routinely testing their athletes. This article discusses how machine-based peak wattage testing can be used as a discreet and economical way to track power development, or lack thereof, which can then be used to gather data and inform training. The article will also provide a step-by-step guide for strength and conditioning coaches who wish to implement this test.

HOW DID THIS IDEA COME ABOUT?

There is a distinct difference between conventional military and special forces training facilities in the *NSCA's Essentials of Tactical Strength and Conditioning* (1). To elaborate, dedicated strength and conditioning weightrooms are rare in conventional military settings. These weightrooms can also be difficult to access or unfeasible to use due to inadequate resources, high demand, and occupancy limitations. Furthermore, existing conventional facilities often lack performance-tracking technology, such as force plates and velocity-based training tools. These are obstacles for practitioners who thrive on benchmarks and actionable data for key stakeholders. Fortunately, conventional military weightrooms tend to be overcrowded with popular computerized machines such as bikes, rowers, treadmills, and ski-ergometers. This presents practitioners with a unique opportunity to use such machines to test and monitor fluctuations in peak wattage or power. These power fluctuations are invaluable for strength and conditioning professionals, regardless of sector, who are attempting to understand their athletes' preparedness and adaptability amidst training. The following sections discuss efficacy and execution for this proposed peak wattage test.

TEST EFFICACY

Power can be defined as "the rate of doing work," and it is a key performance indicator in sports like football, basketball, baseball, volleyball, and rugby (2). Common power tests in strength and conditioning for these sports include various throws, jump protocols, Olympic lifts, and sprint assessments. The peak wattage test is not meant to replace these tests. Rather, it is another power assessment that strength and conditioning coaches can easily learn and conduct with minimal familiarization. Using it may also be beneficial for monitoring general adaptation syndrome and

identifying early signs of Hans Selye's proposed "exhaustion phase" (2). Furthermore, peak wattage tests can be administered quickly with multiple athletes, thus providing more time for subsequent training. Each assessment in the proposed protocol takes only 6 – 12 s and tests the phosphagen energy system (2).

TEST PROTOCOL

1. Set the machine of choice to a proper height and/or a standardized drag factor for the athlete (e.g., bike height at six or rower drag factor at eight).
 - a. These measurements should be consistent across all subsequent tests and account for any adjustments for the upper and lower body limbs.
2. Instruct the athlete to board the machine and begin moving at a leisurely pace.
3. Explain to the athlete that they will begin to sprint on a "go" command and proceed to stop on a "stop" command.
4. Begin the test by saying "go" once the athlete has confirmed they understand when the test begins and ends.
5. Observe the machine's wattage tracker and stop the test when the wattage begins to decrease.
6. Repeat the test 2 – 3 times, depending on time constraints and the athlete's performance and preference.

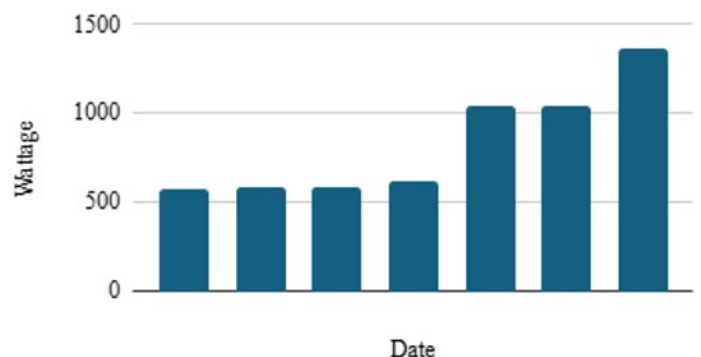


FIGURE 1. EXAMPLE OF BIKE WATTAGE

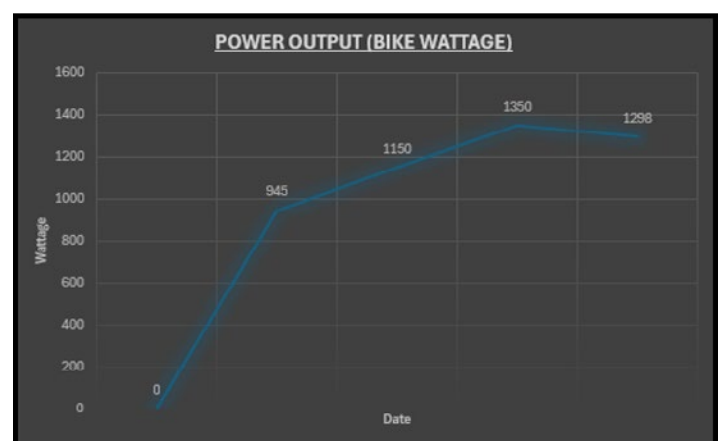


FIGURE 2. EXAMPLE OF BIKE WATTAGE

LIMITATIONS AND ALTERNATIVES

Peak wattage testing can undoubtedly be useful for strength and conditioning coaches; however, certain limitations must be addressed. Computerized exercise machines that track wattage and other health parameters, although cheaper than force plates and velocity-based training tools, can still be costly. Strength and conditioning coaches should therefore familiarize themselves with various power assessments regardless of their budget. Comparable cost-friendly examinations for power include vertical jumps, horizontal jumps, various ball throws, and even hand dynamometer testing (3,6). Another limitation of machine-based peak wattage testing is that cardiorespiratory machines, such as rowers and bikes, inevitably break down over time and may experience computer failures. Additionally, athletes during peak wattage testing will be required to exert themselves maximally, so this may exacerbate the need to replace such equipment. This, however, is more of an issue for strength and conditioning coaches who hope to assess large groups of athletes versus personal trainers who may only see a few clients. Ultimately, strength and conditioning coaches who wish to implement a peak wattage strategy with large groups must first consider implementing or purchasing sturdy machines to ensure safety standards are upheld and that longitudinal data can be collected.

CONCLUSION

It is undeniable that tracking progress is crucial for strength and conditioning coaches. Strength and conditioning coaches and personal trainers alike should have the tools necessary to monitor their athletes'/clients' progress without losing time due to heightened stress and fatigue. Peak wattage tests provide practitioners from these and other sectors with a quick means to equate progress that eventually forges trust from consumers in exercise programs. If nothing else, peak wattage tests are another tool that practitioners can utilize to effectively educate clientele, inform training, identify the need for changes, and, ultimately, tell a story.

REFERENCES

1. Alvar, BA, Sell, K, and Deuster, PA. *NSCA's Essentials of Tactical Strength and Conditioning*. Champaign, IL: Human Kinetics; 2017.
2. Haff, G, and Triplett, NT. *Essentials of Strength Training and Conditioning*. Champaign, IL: Human Kinetics; 2016.
3. Huerta Ojeda, Á, Fontecilla Díaz, B, Yeomans Cabrera, MM, and Jerez-Mayorga, D. Grip power test: A new valid and reliable method for assessing muscle power in healthy adolescents. *Plos One* 16(10): e0258720, 2021.
4. Hureau, TJ, Ducrocq, GP, and Blain, GM. Peripheral and central fatigue development during all-out repeated cycling sprints. *Medicine and Science in Sports and Exercise* 48(3): 391-401, 2016.
5. Liguori. *ACSM's Guidelines for Exercise Testing and Prescription*. Wolters Kluwer; 2021.
6. McMahon, JJ, Lake, JP, and Suchomel, TJ. Vertical jump testing. *Performance Assessment in Strength and Conditioning*. Routledge; 96-116, 2018.
7. Walker, S, Davis, L, Avela, J, and Häkkinen, K. Neuromuscular fatigue during dynamic maximal strength and hypertrophic resistance loadings. *Journal of Electromyography and Kinesiology* 22(3): 356-362, 2012.

ABOUT THE AUTHOR

Robert "Rob" Warner is a Registered Strength and Conditioning Coach (RSCC) through the National Strength and Conditioning Association (NSCA) with an eclectic background in tactical human performance. While contracted for the Holistic Health and Fitness (H2F) program, he served as the primary strength and conditioning coach for the United States Drill Sergeant Academy; the 1-13th Infantry Battalion in Fort Jackson, SC; and the 1-36th Infantry Battalion in El Paso, TX. Warner earned his Bachelor's degree in Communications from the University at Albany, NY, and his Master's degree in Applied Exercise Science from Concordia University Chicago. Additionally, he was published in the TSAC Report 73 for an article titled "Bridging the Gap Between Strength and Conditioning and Mental Readiness in H2F." He hopes to use his knowledge and experiences as a lifelong exerciser to deepen relationships with peers, students, friends, and family.