

Clinician-Friendly Physical Performance Tests for the Hip, Ankle, and Foot

Joseph H. Vogler, MS, ATC; Alexander J. Csiernik, MS, ATC;
Marissa K. Yorgey, MS, ATC; Jerrod J. Harrison, MS, ATC;
Kenneth E. Games, PhD, LAT, ATC

Indiana State University, Terre Haute

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Clinical Question: Do individual physical performance tests (PPTs) for the lower extremity have any relation to injury in athletes 12 years of age and older?

Data Sources: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed to locate articles. Three databases were searched from inception to January 13, 2014: PubMed, CINAHL, and SPORT-Discus. Search phrases were *sport, athletics, athletes, and injuries* combined with *strength, power, endurance, agility, and function*. Reference lists of all remaining articles and personal collections of the authors were then reviewed for any missing articles.

Study Selection: Studies were included according to the following criteria: (1) published in English, (2) presented as complete articles (ie, no abstracts or posters), and (3) involved human participants. Studies were excluded on the following criteria: (1) a combination of PPTs was examined, (2) the results were measured using equipment that was expensive or not readily available to the average clinician, (3) the PPTs examined impairment-level data, (4) the PPTs examined tasks not relevant to the lower extremity, or (5) the participants scored 4 or less on the Tegner Activity Scale. The final analysis involved 31 studies.

Data Extraction: The name of the PPT and methods were extracted. Each PPT was then critiqued using the Consensus-Based Standards for the Selection of Health Measurement Instruments, a 4-point Likert scale. Data were also summarized using a score of *unknown, strong, moderate, limited, or conflicting* for the best evidence synthesis.

Main Results: A total of 14 PPTs were examined; however, names and methods of the PPTs were inconsistent throughout the literature. In descending order, based on frequency of appearance in the literature, the PPTs were (1) 1-legged hop for distance, (2) vertical jump, (3) Star Excursion Balance Test, (4) shuttle run, (5) 6-m timed hop, (6) triple hop, (7) 40-yd sprint, (8) triple crossover hop for distance, (9) 6-m timed crossover hop, (10) T-agility, (11) hexagon hop, (12) medial hop, (13) lateral hop, and (14) multi-stage fitness (beep test). The Star Excursion Balance Test in the anterior, posteromedial, and posterolateral directions was the only test that could help identify injury risk. The 1-legged hop for distance and hexagon hop showed a moderate ability to differentiate between normal and unstable ankles. In dancers, the medial hop in dancers differentiated between painful and normal hips with moderate evidence.

Conclusions: Very little evidence supports the use of PPTs for athletes with lower extremity injuries. A panel of experts needs to standardize the names and methods of widely accepted tests.

Key Words: Star Excursion Balance Test, hop for distance, hexagon hop, medial hop, vertical jump

COMMENTARY

This study focused on physical performance tests (PPTs), commonly referred to as *functional tests*, which are used by a variety of clinicians to predict injuries and distinguish between patients who are injured and therefore unable to withstand the stresses of activity and patients who are uninjured.¹ However, standardization among professions and clinicians regarding test names and methods is limited.¹ The lack of standardization makes it difficult for clinicians to use the literature to choose an appropriate PPT for evaluating a patient.¹

Before returning to activity after an ankle injury, a patient should be able to functionally perform at 80% when compared with the uninjured extremity.² However, few validated tests can be performed easily without requiring expensive equipment, such as force platforms or motion-analysis systems.³ Two tests in this category are the Star

Excursion Balance Test (SEBT) and the Y-Balance Test/modified SEBT, both of which are valid and require minimal equipment.^{3,4}

Physical performance testing for the hip should be implemented as often as testing is performed on the knee and ankle.⁵ Yet few PPTs have been validated for the hip PPTs, except for the SEBT and the 1-legged stance test to assess hip-abductor function.⁵

The authors did not evaluate whether these PPTs indicate a patient's readiness to return to activity but rather assessed whether they can be used to evaluate injury risk. Evidence was lacking or poor to support the use of the 1-legged hop for distance, vertical jump, shuttle run, 6-m timed hop and crossover hop, 40-yd sprint, triple crossover hop, and lateral hop.¹ Moderate evidence supported the use of the 1-legged hop for distance and the hexagon hop in participants with unstable ankles as well as the medial hop for dancers with

painful hips,¹ although reliability of both the 1-legged hop for distance and the hexagon hop was poor.¹

The best evidence supported the use of the previously validated SEBT, especially in the anterior, posteromedial, and posterolateral directions.¹ When performed in those directions, the SEBT is commonly referred to as the *modified SEBT* or *Y-Balance Test*, which can be conducted with or without the Y-Balance Test Kit in a quick and affordable manner while increasing the efficiency of the SEBT.^{4,6} The anterior, posteromedial, and posterolateral directions had the most predictive ability for increased injury risk.¹ Gribble et al³ established that with a difference of more than 4 cm in anterior reach between the lower extremities, the individual is at a 2.5 times increased risk for a noncontact injury, and a composite reach score with a

difference greater than 94% is associated with increased injury risk.

As the current authors and previous authors have indicated, randomized controlled trials and clinical research on PPTs in athletic populations are needed, specifically for patients with hip injuries.^{1,5} This work should focus on return-to-activity standards, given that most of the literature to date has attempted to identify injury risk associated with PPTs. Also, we need a consensus panel of experts to standardize the names and methods of PPTs that are commonly used by clinicians.¹ This standardization will help clinicians locate future research, as well as increasing intertester reliability and decreasing confusion when they document medical records and communicate with other health care and athletic professionals.

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Address correspondence to Joseph H. Vogler, MS, ATC, Indiana State University, 567 North 5th Street, Room 254, Terre Haute, IN 47809. Address e-mail to jvogleratc@gmail.com.