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José Afonso

# Field-based Tests for Soccer Players

Methodological Concerns  
and Applications

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# Chapter 1

## Introduction



### 1.1 Rationale for Understanding Accuracy, Precision, and Repeatability Levels of Field-Based Tests

Assessment of athletic performance in soccer has part of the periodic process of monitoring the player's adaptations over the season (Enright et al. 2018). Such period assessment allows coaches to individualize the training process based on the current status of the players and, eventually, identify the responses of the players to the training stimulus provided between assessments (Clemente et al. 2019). Therefore, the assessment of athletic performance is a support and orientation process allowing coaches to, possibly, better design training process and sooner identify trajectories of fitness development of the players (McLaren et al. 2018). This is of paramount importance considering the biological heterogeneity of the players to the similar and/or standardized training stimulus (Muñoz-López and Naranjo-Orellana 2020).

Usually, different tests are used for assessing the athletic performance in soccer due to the multidimensional factors of performance (Murr et al. 2018). Therefore, amongst other possibilities, testing battery for the assessment of athletic performance in soccer players includes (Turner et al. 2011): (a) vertical jump height (e.g., squat, countermovement jump and/or drop jump); (b) a linear speed, acceleration, and change-of-direction test; (c) muscular strength and power test; and (d) an aerobic capacity test (e.g., yo-yo intermittent recovery test, 30–15 intermittent fitness test). Other possibilities as repeated-sprint ability (Wragg et al. 2000), or horizontal jump (Chamari et al. 2008) tests can be also assessed.

The application of field-based tests became predominant in soccer due to the easy-to-use process and trying to achieve a higher specificity (Da Silva et al. 2011). In fact, trying to overcome the tension between the high reliability and low ecological validity of laboratorial tests and the low reliability and high validity of field-based methods (Reilly et al. 2009), an increase in the assessment of accuracy, precision, and repeatability articles related to the use of field-based tests was observed even in systematic reviews about specific tests (Grgic et al. 2020; Grgic et al. 2019). In

fact, the determination of measurement error statistics such as the technical error of measurement is critical due to the fact that wrong inferences can be performed regarding human responses, whilst the issue can be related to the measurement test (Atkinson et al. 2019).

Therefore, knowing the accuracy, precision, and repeatability levels of field-based tests in different soccer populations (age-groups, sexes, competitive levels) is determinant to allow identify the error associated with the use of each specific test and allow coaches and sports scientist to use the most appropriate tests for each population. Although the existence of some articles and reviews dedicated to the summary of evidence about accuracy and/or precision of field-based tests (Grgic et al. 2020, 2019), they are restricted to a specific test and do not covering all the possibilities and taking into consideration the adequation for different populations.

The systematization of accuracy, precision, and repeatability of different field-based tests in soccer in a unique book may help coaches and sports scientists to have an overview of the state-of-the-art about the topic, potentially allowing them to make decisions about the most appropriate tests to use in practice. This, in this book the readers will have access to the following items: (a) summary of the accuracy, precision, and repeatability levels of field-based tests applied in soccer; (b) list of the accurate, precise, and repeatability field-based tests to different age-groups and sexes; and (c) description of the field-based tests and typical values.

## References

- G. Atkinson, P. Williamson, A.M. Batterham, Issues in the determination of ‘responders’ and ‘non-responders’ in physiological research. *Exp. Physiol.* **104**(8), 1215–1225 (2019). <https://doi.org/10.1113/EP087712>
- K. Chamari, A. Chaouachi, M. Hambli, F. Kaouech, U. Wisløff, C. Castagna, The five-jump test for distance as a field test to assess lower limb explosive power in soccer players. *J. Strength Cond. Res.* **22**(3), 944–950 (2008). <https://doi.org/10.1519/JSC.0b013e31816a57c6>
- F.M. Clemente, P.T. Nikolaidis, T. Rosemann, B. Knechtle, Dose-response relationship between external load variables, body composition, and fitness variables in professional soccer players. *Frontiers Physiol.* **10** (2019). <https://doi.org/10.3389/fphys.2019.00443>
- J.F. Da Silva, L.G.A. Guglielmo, L.J. Carminatti, F.R. De Oliveira, N. Dittrich, C.D. Paton, Validity and reliability of a new field test (Carminatti’s test) for soccer players compared with laboratory-based measures. *J. Sports Sci.* **29**(15), 1621–1628 (2011). <https://doi.org/10.1080/02640414.2011.609179>
- K. Enright, J. Morton, J. Iga, D. Lothian, S. Roberts, B. Drust, Reliability of “in-season” fitness assessments in youth elite soccer players: a working model for practitioners and coaches. *Sci. Med. Football* **2**(3), 177–183 (2018). <https://doi.org/10.1080/24733938.2017.1411603>
- J. Grgic, B. Lazinica, Z. Pedisic, Test-retest reliability of the 30–15 intermittent fitness test: a systematic review. *J. Sport Health Sci.* 0–20 (2020). <https://doi.org/10.1016/j.jshs.2020.04.010>
- J. Grgic, L. Oppici, P. Mikulic, J. Bangsbo, P. Krustrup, Z. Pedisic, Test-retest reliability of the yo-yo test: a systematic review. *Sports Med.* **49**(10), 1547–1557 (2019). <https://doi.org/10.1007/s40279-019-01143-4>
- S.J. McLaren, A. Smith, J.D. Bartlett, I.R. Spears, M. Weston, Differential training loads and individual fitness responses to pre-season in professional rugby union players. *J. Sports Sci.* **36**(21), 2438–2446 (2018). <https://doi.org/10.1080/02640414.2018.1461449>

- A. Muñoz-López, J. Naranjo-Orellana, Individual versus team heart rate variability responsiveness analyses in a national soccer team during training camps. *Sci. Rep.* **10**(1), 11726 (2020). <https://doi.org/10.1038/s41598-020-68698-5>
- D. Murr, J. Raabe, O. Höner, The prognostic value of physiological and physical characteristics in youth soccer: a systematic review. *Eur. J. Sport Sci.* **18**(1), 62–74 (2018). <https://doi.org/10.1080/17461391.2017.1386719>
- T. Reilly, T. Morris, G. Whyte, The specificity of training prescription and physiological assessment: a review. *J. Sports Sci.* **27**(6), 575–589 (2009). <https://doi.org/10.1080/02640410902729741>
- A. Turner, S. Walker, M. Stembridge, P. Coneyworth, G. Reed, L. Birdsey, J. Moody, et al.: A testing battery for the assessment of fitness in soccer players. *Strength Conditioning J.* **33**, 29–39 (2011). <https://doi.org/10.1519/SSC.0b013e31822fc80a>
- C.B. Wragg, N.S. Maxwell, J.H. Doust, Evaluation of the reliability and validity of a soccer-specific field test of repeated sprint ability. *Eur. J. Appl. Physiol.* **83**(1), 77–83 (2000). <https://doi.org/10.1007/s004210000246>