The validity and training sensitivity of health- and skill-related physical fitness tests

Alexis Barbry*[1], Annie Carton[2], Herve Ovigneur[3], and Jeremy Coquart[4]

[1]UFR Sciences Fondamentales et Appliquées [Université de Lorraine] – Université de Lorraine, Laboratoire Lorrain de Psychologie et Neurosciences de la Dynamique des Comportements (2LPN, EA 7489) – France

[2]Univ. Artois, Univ. Lille, Univ. Littoral Côte d'Opale, ULR 7369 - URePSSS - Unité de Recherche Pluridisciplinaire Sport Santé Société, Liévin, France. – Université d'Artois, Atelier SHERPAS (URePSSS, ULR 7369) – France

[3]IRFO – Institut des Rencontres de la Forme [Wattignies] – France

[4]Univ. Lille, Univ. Artois, Univ. Littoral Côte d'Opale, ULR 7369 - URePSSS - Unité de Recherche Pluridisciplinaire Sport Santé Société, Lille, France. – Equipe - Activité Physique, Muscle et Santé (APMS). – France

Résumé

Introduction: Physical Fitness (PF) is a key health and performance indicator (American College of Sports Medicine, 2021). Test batteries like Diagnoform assess PF, but despite growing attention in the scientific literature (due to the 268,000 data collected), the validity and sensitivity of four Diagnoform tests remain insufficiently verified (Duclos et al., 2022; Mouraby et al., 2012). This cohort study aimed to evaluate the validity and training sensitivity of four Diagnoform tests: 3-Minute Shuttle Run (MSR), cross test, modified-plank test and modified-unipedal stance test.

Methods: Sixty-five runners completed four Diagnoform tests and four reference tests recognized by the scientific literature measuring the same PF components. CardioRespiratory Fitness (CRF) was assessed with the 3-MSR and an incremental intermittent field test (45-15FIT) (Assadi & Lepers, 2012). Agility was tested with the cross and hexagon agility tests (Beekhuizen et al., 2009). Muscular Endurance (ME) was assessed with the modified plank, and sport-specific endurance plank tests, and balance with modified and standard unipedal stance tests (Springer et al., 2007; Tong et al., 2014). A bivariate correlation examined the relationships between Diagnoform and reference tests. The Wilcoxon signed-rank test compared performance changes after 8 weeks of running training. Effect Size (ES) was calculated.

Results: Correlation was very high for CRF ($p < 0.001$, $r = 0.932$), moderate for agility ($p < 0.001$, $r = 0.502$), high for ME ($p < 0.001$, $r = 0.716$), and significant but low for balance ($p = 0.003$, $r = 0.376$). No statistical differences in performance changes were observed between Diagnoform tests and reference tests ($p = 0.602$, $ES = 0.050$ for CRF; $p = 0.114$, $ES = 0.173$ for agility; $p = 0.913$, $ES = 0.012$ for ME; and $p = 0.492$, $ES = 0.074$ for balance).

Discussion: The very high correlation between both CRF tests might be attributed to their potential relationship with maximal aerobic speed, a well-established field criterion

*Intervenant

measure of CRF (Assadi & Lepers, 2012; Mouraby et al., 2012). For agility, the correlation observed could be explained by the characteristics as regards the scientific definition of agility, observed in both tests (*e.g.,* quickly change direction with precision) (American College of Sports Medicine, 2021). Although both ME tests differ in their duration, the correlation between these tests is probably due to some similarities in their content (*e.g.,* hold an isometric plank position, lift arms). The association between the balance tests might be explained by the unipedal position under similar conditions (*i.e.,* eyes open and eyes closed) involved in both tests.

Conclusions / Perspectives: These results support the validity and sensitivity of four Diagnoform tests. These field-based, inexpensive, valid, sensitive and quick-to-administer PF tests offer practical tools for sport and health professionals to monitor PF. The large number of individuals who have undergone the Diagnoform, could assist professionals in rapidly identifying the PF component level of their population compared to matched age- and sex- individuals.

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