Clinician's Commentary on Oliveira et al.¹

Activities that are performed with the upper limbs (ULs), especially unsupported activities such as brushing teeth, combing hair, and putting groceries on a shelf, lead to increased metabolic demand in healthy individuals.² Couser and colleagues² demonstrated in their study that simple arm elevation in healthy individuals may cause an increase in ventilatory and metabolic demand similar to that in mild-intensity exercise, with an increase in oxygen consumption and heart rate of as much as 16%. In addition to this increased metabolic demand for a simple activity, people with different chronic diseases such as stroke and chronic obstructive pulmonary disease (COPD) have, for different reasons, difficulty performing activities with their ULs. Despite this knowledge, the test options for assessing UL function and endurance in populations with or without disability are few. Moreover, information on the psychometric properties of the available tests is limited. Oliveira and colleagues¹ conducted a study in healthy individuals to examine the within-day test–retest reliability of an UL test, the Unsupported Upper Limb Exercise Test (UULEX), that was originally designed for people with COPD. The UULEX measures peak UL exercise capacity, but it could also be considered an endurance test³ because its outcome is the maximum time that the individual performs the task. The authors included 100 healthy individuals of both genders who, for the purpose of the analysis, were divided into two groups, those aged 18–50 years and those aged 50 years or older. This study adds to the knowledge about the psychometric properties of a fairly unknown test that can be useful for professionals working on UL training with people with or without disability.

Despite the difference in the number of individuals in each group (younger adults, $n = 64$; older adults, $n = 36$), the results showed that UULEX had good within-day test–retest reliability in both groups. On the basis of their findings, the authors suggest that only one test is sufficient to achieve reliable results in younger individuals, whereas more than two tests seem to be necessary for older individuals (younger adults, intra-class correlation coefficient [ICC][2,1] = 0.88, 95% CI: 0.82, 0.92; older adults, ICC[2,1] = 0.82, 95% CI: 0.72, 0.90).

Previous studies have shown the UULEX to be correlated with UL muscle strength and endurance.^{3,4} Evidence has suggested that the aging process alone, regardless of whether it is associated with comorbidities, can promote a reduction in muscular functional performance, which can lead to worse performance of activities of daily living that involve the ULs⁵ as well as physical disabilities.⁶

In agreement with this evidence, Oliveira and colleagues¹ observed that older individuals performed worse on the UULEX than younger individuals. In their study, in addition to worse performance on the UULEX, the authors also demonstrated that two practices of the test are necessary to account for learning effects in older individuals. Because the UULEX requires the use of relatively large muscle groups of the ULs, it is surprising that older individuals were able to maintain a long test time (mean > 500 s) and also improve their performance after two practices. As the authors commented, performance of three tests might not be feasible in every setting. Nevertheless, these individuals' physical fitness was not assessed, which could have

been an important confounding factor because physical activity has been shown to influence not only well-being but also motor performance and the motor learning process of UL tasks.⁷ Older adults with a better level of physical activity have been shown to have a better learning effect when they perform UL tasks. It has also been shown that motor memory needs time to consolidate learning (e.g., > 24 h), which does not seem to be the case in the Oliveira and colleagues study. Therefore, as they suggested, the reduction in anxiety related to the test performance after one or two practices could have been the determinant of the results rather than the learning effect itself.

The second objective of Oliveira and colleagues¹ study was to evaluate the relationship of UULEX performance to gender in healthy individuals. They reported that gender had no influence on UULEX performance. As previously mentioned, the UULEX uses relatively large muscle groups of the UL, and it is surprising that Oliveira and colleagues did not find a gender effect. Again, the level of physical activity of men versus women might have explained this lack of a gender effect.

In summary, Oliveira and colleagues¹ study adds to the body of knowledge about the psychometric properties of the UULEX, which can be used to assess peak exercise capacity in people with or without disability. The choices that professionals make in their practice should always be based on research evidence, and knowing the psychometric properties of the tests can help guide their decisions.

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