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Sport climbing determinants and functional testing methods: a systematic review-based proposal for standardised functional performance assessment

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INTRODUCTION:

Lead climbing, bouldering and speed climbing are becoming incredibly popular both in the general population and among athletes. Indeed, sport climbing made its debut in the 2021 Olympics Games in Tokyo. However, no consensus exists regarding evidence-based sport-specific performance evaluation; therefore, the present systematic review aims to provide an overview of climbing performance determinants and evaluation methods by analysing climbers of different ability levels.

METHODS:

A systematic search of PubMed, Scopus, and Web of Science was performed. Studies providing the self-reported climbing ability associated with different functional outcomes in groups of climbers of contiguous performance levels were included. Functional components of interest were cardiorespiratory endurance, muscular strength, muscular endurance, muscular power, flexibility, balance, and anthropometric characteristics assessed by general or climbing-specific functional tests. Concurrent and construct validity as well as reliability have been evaluated for qualitative test assessment.

RESULTS:

A total of 1789 articles was retrieved and 70 studies were finally included. Various methods have been proposed to evaluate determinants of sport climbing. While test validity evaluations were available, reliability measures have been rarely provided. Climbing-specific assessments were able to discriminate better climbers of different levels when compared to general functional tests. Validity resulted high for climbing-specific cardiorespiratory endurance, muscular -strength, -endurance and -power, although the reliability analysis of the former was insufficient. Climbing-specific assessment of flexibility resulted in high reliability, but moderate validity, whereas balance showed low validity. Regarding anthropometric characteristics, huge conflicting evidence is depicted since many studies found results not supporting a significant impact of these parameters on climbing performance.

CONCLUSION:

While some conclusive evidence can be drawn for cardiorespiratory endurance, muscular -strength, -endurance, and -power assessment, by contrast flexibility, balance, and anthropometric characteristics are still far to be topic on fire in sport climbing and need further specific scientific evaluations. This review also provides a proposal for an evidence-based functional performance assessment protocol for sport climbers, which considers (i) the available test validity and (ii) reliability for the broadest range of climbing performance levels, (iii) the simplicity of standardisation of testing procedures, and (iv) the minimum financial and equipment constraints. While athletes and coaches may engage in evidence-based and standardised evaluation methods, researchers should design specific large-scale trials as a resource in providing additional, homogenous, and comparable data in order to improve scientific evidence and professionalism in this popular sport discipline.

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