

## ESTABLISHING A GLOBAL SCALE FOR ASSESSING LEAD CLIMBING PERFORMANCE

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### ABSTRACT - ENGLISH

*The aim of this study was to design an observational instrument for assessing the quality of climbing movement. Research has previously focused on observational instruments that assess the execution of technical skills in top rope climbing, competition climbing and traditional climbing, however, the present study aimed to establish a tool that assesses salient factors of climbing movement at a global level. Firstly, a panel of expert coaches were consulted in order to identify salient factors required for lead climbing performance. Exhaustive lists of factors were reviewed and ambiguous terms were defined, duplicates were then removed and the factors were categorised into common areas. A second round of consultation allowed for further refinement by identifying areas that were either not represented, or to highlight other confounding issues. To confirm the findings of the expert panel and to provide an indication of face validity, coaches were asked to rank each of the factors in each category in order of perceived importance. Finally, a scale was constructed that consisted of 5 subscales containing 14 items. The quality of each item was rated used a 5-point scale, 1 indicating a poor level of skill, and 5 indicating a high level of skill with minimal or no errors in performance. Coaches and researchers have reported that the scale has useful application in its predictive abilities and for profiling climbers' performance. Continuing work will aim to quantify the predictive validity and inter- and intra-rater reliability of the scale.*

### KEYWORDS - ENGLISH

Expert coaches; Lead Climbing; Climbing Performance, Global Observational Scale

**ABSTRACT – FRENCH**

*Le but de cette étude était de concevoir un instrument d'observation pour évaluer la qualité du mouvement d'escalade. La recherche s'est précédemment concentrée sur les instruments d'observation qui évaluent l'exécution des compétences techniques en escalade, escalade de compétition et escalade traditionnelle. Cependant, la présente étude visait à établir un outil qui évalue les facteurs saillants du mouvement d'escalade au niveau mondial. Tout d'abord, un panel d'experts a été consulté afin d'identifier les facteurs saillants nécessaires à la performance de l'ascension du plomb. Des listes exhaustives de facteurs ont été examinées et des termes ambigus ont été définis, les doublons ont ensuite été supprimés et les facteurs ont été catégorisés en zones communes. Une deuxième série de consultations a permis d'affiner les choses en identifiant les zones qui n'étaient pas représentées ou de mettre en évidence d'autres problèmes confondants. Pour confirmer les conclusions du groupe d'experts et fournir une indication de la validité apparente, on a demandé aux entraîneurs de classer chacun des facteurs dans chaque catégorie par ordre d'importance perçue. Finalement, une échelle comprenant 5 sous-échelles contenant 14 items a été construite. La qualité de chaque élément a été évaluée en utilisant une échelle de 5 points, 1 indiquant un faible niveau de compétence et 5 indiquant un niveau élevé de compétence avec des erreurs de performance minimales ou inexistantes. Les entraîneurs et les chercheurs ont signalé que l'échelle a une application utile dans ses capacités prédictives et pour établir le profil des performances des grimpeurs. La poursuite des travaux visera à quantifier la validité prédictive, la fiabilité inter et intra-évaluateur de l'échelle.*

**KEYWORDS - FRENCH**

Entraîneurs experts; Escalade de plomb; Performance d'escalade, échelle d'observation globale

## INTRODUCTION

Despite climbing being recognised as a sport that requires a high level of coordination and technique (Magiera et al., 2013), to date the majority of climbing research has focused on physiological and psychological characteristics of climbing performance. Consequently, there has been limited use of performance measures that assess the application of skill and technique of an ascent. Simple measures of success and failure, and competition points have been used as indications of performance in a small number of studies (Draper, Dickson, Fryer, & Blackwell, 2011; Sanchez, Boschker, & Llewellyn, 2010; Hernández, Blanco, Rodríguez & Martín, 2014), but provide limited information on the execution of skill or quality of the ascent. Although it is possible to quantify climbing fluency through the use of spatiotemporal measures, such as the geometric entropy index (Cordier, France, Bolon & Pailhous, 1993), it is argued that further information is required to gain a comprehensive picture of how a climber skilfully executes motor skills required for ascent of a route (Orth, Kerr, Davids & Serfert, 2017). Considering the limitations of a single measure and the questionable transferability of previous performance instruments, the present study aimed to construct a global scale for assessing salient performance factors during a lead climb ascent.

## METHODS

The study design was comprised of three parts, following the methods set out previously in Chidley, MacGregor, Martin, Arthur, and Macdonald (2015). Firstly, salient factors in climbers' performance were identified through consultation with expert coaches. The second stage involved further consultation that involved refining, ranking and grouping common performance factors. The final part of the study produced the performance scale for practical application.

### *Part 1: Identification of salient factors in climbers' performance*

Through selective sampling, 10 expert coaches of regional and national level were invited to contribute to the development of a climbing performance rating scale to be used in both coaching and research. The expert coaches were asked to consider salient factors that identify the quality of climbing performance during an indoor lead ascent. It was highlighted that salient factors should not be tied to specific moves (e.g. rock over), which may, or may not, be present in a given performance. Rather, it should describe factors that are common to all movements, differentiating between those that are inappropriately selected and poorly executed and those that are appropriate and perfectly executed (and those in between). Completed by email and in person and through an iterative process an extensive list of performance factors were identified. Ambiguous terms were defined, and duplicates removed, and the factors were then categorised into key/ common areas.

### *Part 2: Determination of key elements of climbers' performance*

A second round of consultation allowed for further refinement by identifying areas that were either not represented, or to highlight other confounding issues. To confirm face validity and for the expert panel to provide an indication of the importance of each performance factor, the coaches were asked to rank each one in order of their perceived importance.

The following definition of skill in climbing provided as a point of reference: “*the ability to co-ordinate a series of complex, whole body, movements to ascend a predefined route with economy of movement*”. In order to assess skill against the definition the identified list of factors and categories were assessed based on the rankings provided.

### ***Part 3: Development of performance scale***

The final part produced the performance scale that consisted of 5 categories (subscales) containing 14 factors. Each category and factor was defined to delineate observed climbing behaviour and correctly attribute the appropriate score. The scoring sheet was based on a 5- point scale and each factor had a unique descriptor for a poor or non-existent component (1) and a flawless demonstration of skilled performance (5). From the scale, it was then possible to calculate an average score for each of the five categories of base of support, transitioning, co-ordination, technique and tactics. The scale allowed for a route to be scored as a whole and in two halves thus providing information on the consistency of a performance. The final climbing performance scale categories and items (in brackets) are shown below:

#### ***1. Base of Support (accuracy and precision / adjustments):***

Climbers interface with the holds on routes with both their hands and feet, which form the climber’s base of support. Accurate and precise placements without re-adjustment to facilitate efficient economical climbing movement.

#### ***2. Transitioning Movement (dynamic balance / fluidity and linking / exploratory movements /sequencing):***

Ascending a route requires climbers to use momentum to link moves between positions while remaining in balance. Fluidly in transitions between movements allows the maintenance of momentum. To facilitate these movements, the climber should observe and execute sequences of movements without mistakes, hesitation or the need to reach out and feel hand and foot holds.

#### ***3. Coordination (movement initiation / extension and body tension):***

The climber should coordinate the whole body in the correct sequence throughout whole movements while extending and maintaining body tension, without unnecessary movement, to keep weight over the base of support.

#### ***4. Technique (repertoire of movement skills and techniques):***

The climber should select appropriate movements for the routes, skilfully apply techniques, employ the most biomechanically advantageous form of movement to complete a given move and route.

#### ***5. Tactics (tempo | commitment and confidence | rests | clipping):***

While ascending the route, the climber should make a number of tactical decisions, including the selection of pace appropriate to the difficulties of the route, ascending without hesitation, and select appropriate rest positions and clipping positions that minimise unnecessary energy expenditure.

## FINDINGS & DISCUSSION

The findings of the present work have informed the design of a global climbing performance scale that measures five categories and 14 items that together contribute to skilful performance. The complex and multifaceted nature of climbing necessitates the need to identify common factors without losing the gestalt of the movement (Knudson, 2012). Each climbing route affords movement solutions that are dependent on each individual's characteristics (physiology, psychological, anthropometric and so forth), make it difficult to prescribe one method of ascent. In the present study the intention was to construct a scale for assessing the invariant features of skilful climbing movement as opposed to discrete movements.

Although several studies have previously attempted to construct observational instruments to assess technical and tactical aspects of climbing performance (Hardy and Hutchinson, 2007; Hernandez, Blanco, Rodriguez & Martin, 2014; De Benito, Garcia- Tormo, Izquierdo, Sedano, Redondo, & Cuadrado, 2013), the instruments are limited to specific climbing disciplines or ability levels. To our knowledge this is the first study within the climbing performance literature that has constructed an observational instrument to assess lead climbing performance at a global level. The resultant scale has addressed content validity by consulting expert coaches as well as acknowledging findings from climbing performance research and human movement literature (Arbulu, Usabiaga & Castellano, 2015; Medernach, Kleinoder & Lotzerich, 2016; White & Olsen, 2010; Orth, Kerr, Davids & Seifert, 2017; Hernandez, Blanco, Rodriguez & Martin, 2014; De Benito, Garcia- Tormo, Izquierdo, Sedano, Redondo, & Cuadrado, 2013; Knudson, 2013). The final categories were as follows: the base of support, transitioning of movement, coordination of movement, repertoire of techniques and tactical elements of lead climbing.

The produced scale is a useful tool for coaches and researchers that allow for the identification of coachable characteristics that could complement existing measures such as geometric entropy, and climbing time. Current work aims to quantify the predictive validity of the tool and inter, intra- rater reliability levels.

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