Colloquium

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Institute of Exercise Training and Sport Informatics

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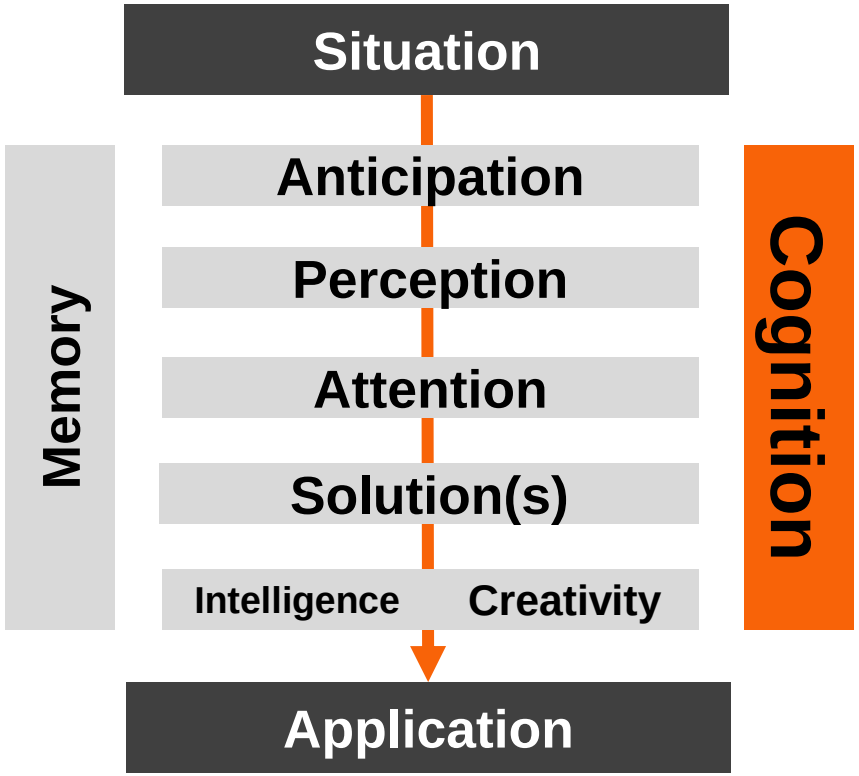
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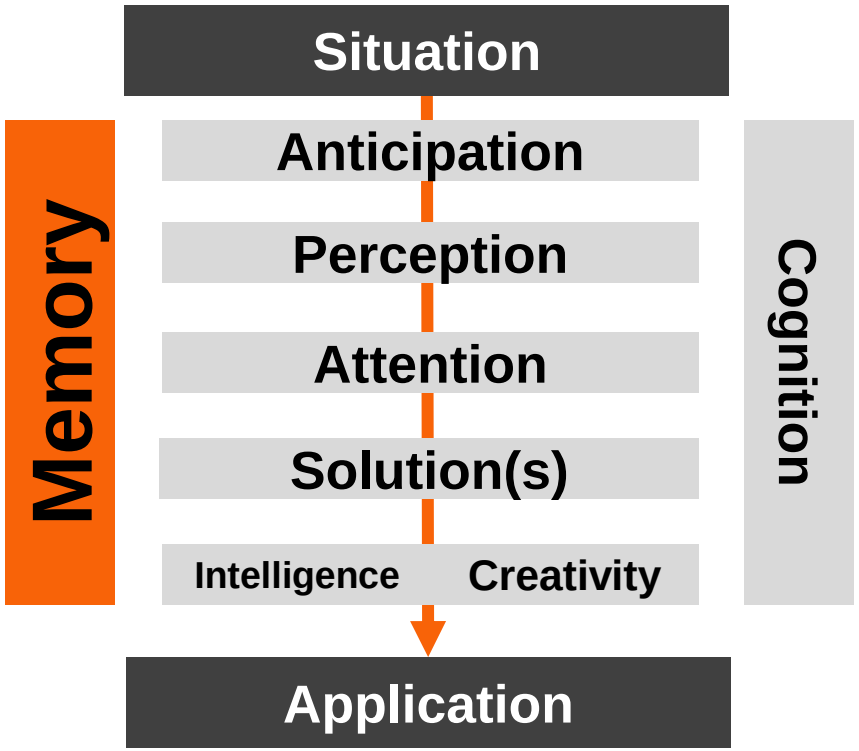
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SPORT AND EXERCISE PSYCHOLOGY

Mechanisms underlying superior memory of skilled climbers in indoor bouldering

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ABSTRACT

Introduction: Bouldering is an Olympic climbing discipline that encompasses short climbing sequences, referred to as boulders, set up on low-height bouldering walls. Memory plays a critical role in bouldering, as it allows climbers to develop climbing strategies, to mentally rehearse climbing movements, and to recall climbing holds of boulders. This study extends previous research on memory in climbing and bouldering with the purpose to elucidate potential mechanisms underlying superior memory abilities of skilled climbers.

Methods: Sixty climbers with intermediate ($n = 20$), advanced ($n = 20$), or elite ($n = 20$) skill levels were tasked to memorise the climbing holds and movements of a boulder, set up on a spray wall and demonstrated by a bouldering expert.

Results: Findings revealed a positive relation between the participants' bouldering skills and sport-specific movement knowledge and both, the number of climbing holds and movements they were able to memorise following a two-minute rehearsal period.

Conclusion: Consistent with previous research, bouldering expertise is positively associated with the ability to memorise domain-specific information. Superior memory abilities among skilled climbers appear to be associated with climbing-specific movement knowledge, coupled with better mental visualisation and increased attentional focus towards functional aspects of boulders.

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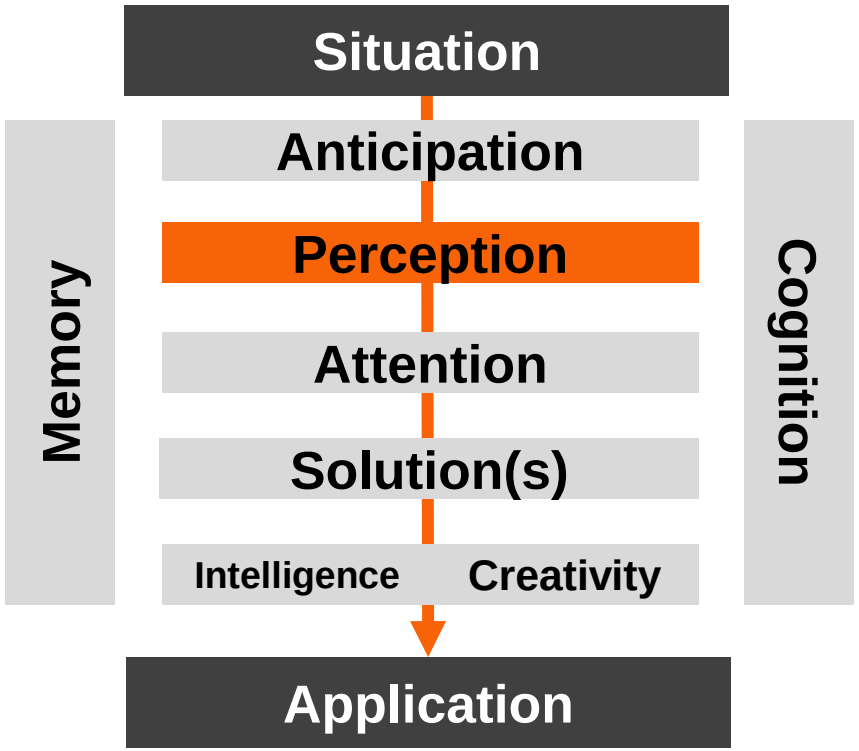
KEYWORDS
Movement knowledge; climbing; route previewing; chunking; mental simulation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Cognitive-behavioural processes during route previewing in bouldering☆

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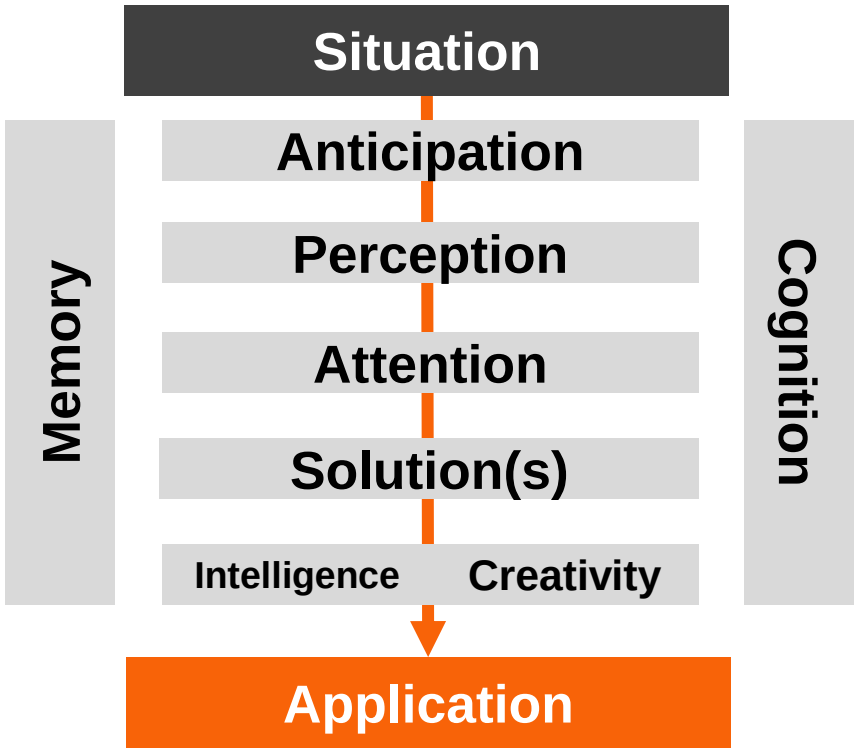
ABSTRACT

Introduction: In the Olympic climbing discipline of bouldering, climbers can preview boulders before actually climbing them. Whilst such pre-climbing route previewing is considered as central to subsequent climbing performance, research on cognitive-behavioural processes during the preparatory phase in the modality of bouldering is lacking. The present study aimed at extending existing findings on neural efficiency processes associated with advanced skill level during motor activity preparation by examining cognitive-behavioural processes during the previewing of boulders.

Methods: Intermediate ($n = 20$), advanced ($n = 20$), and elite ($n = 20$) climbers were asked to preview first, and then attempt two boulders of different difficulty levels (boulder 1: advanced difficulty; boulder 2: elite difficulty). During previewing, climbers' gaze behaviour was gathered using a portable eye-tracker.

Results: Linear regression revealed for both boulders a significant relation between participants' skill levels and both preview duration and number of scans during previewing. Elite climbers more commonly used a superficial scan path than advanced and intermediate climbers. In the more difficult boulder, both elite and advanced climbers showed longer preview durations, performed more scans, and applied less often a superficial scan path than in the easier boulder.

Conclusion: Findings revealed that cognitive-behavioural processes during route previewing are associated with climbing expertise and boulder difficulty. Superior domain-specific cognitive proficiency seems to account for the expertise-processing-paradigm in boulder previewing, contributing to faster and more conscious acquisition of perceptual cues, more efficient visual search strategies, and better identification of representative patterns among experts.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RESEARCH ARTICLE

Effects of decision-making on indoor bouldering performances: A multi-experimental study approach

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Abstract

The purpose of this study was to investigate whether novice, intermediate, and advanced bouldering athletes would differ in their decision-making abilities and to what extent distinct problem-solving tactics would affect the athletes' bouldering performances. Seventy-seven male bouldering athletes participated in a multi-experimental study with the conceptual replication of three bouldering tasks. Participants were allocated according to their ability levels to the novice group (NOV with $n = 18$), the intermediate group (INT with $n = 18$), or the advanced group (ADV with $n = 41$). The data collected for movement analysis via video consisted of the pre-ascent decision-making times, the number of movement deviations from the best solution, the number of movement mistakes, the average gripping times, the bouldering times to the top, the number of successful ascents, and the number of attempts to complete the tasks. Results among all three experiments revealed shorter decision-making times, fewer movement mistakes, and shorter average gripping and bouldering times to the top in the ADV group than in the NOV group and the INT group. Furthermore, participants from the ADV group demonstrated fewer movement deviations than participants from the NOV group (in all three experiments) and the INT group (Experiment 1 and Experiment 2). Moreover, participants from the ADV group and the INT group were characterized, in all three experiments, by a higher number of successful ascents and a lower number of attempts to complete the tasks than participants from the NOV group. In total, these findings emphasize that accomplished decision-making abilities consist of a key determinant in successful indoor bouldering performances.

Citation: Medernach JP, Memmert D (2021) Effects of decision-making on indoor bouldering performances: A multi-experimental study approach. PLoS ONE 16(5): e0250701. https://doi.org/10.1371/journal.pone.0250701

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Sport, Exercise, and Performance Psychology

Role of Strategic Planning in Climbing Performance: The Case in Olympic Bouldering

--Manuscript Draft--

Manuscript Number:	SPY-2024-0479R1
Full Title:	Role of Strategic Planning in Climbing Performance: The Case in Olympic Bouldering
Abstract:	Abstract (209 words) Bouldering is an Olympic discipline that encompasses a series of short climbing sequences on low-height structures called boulders. Strategic planning is paramount in competitive bouldering to both identify suitable climbing strategies before climbing and adapt climbing strategies after failed attempts. This study aimed at examining strategical planning in competitive bouldering to gain further insight into mechanisms underlying strategy proficiency in competitive bouldering. All 30 competitors in men's semi-final at a national bouldering championship voluntarily participated in the study. We examined a series of climbing-related performance parameters, including the suitability of the competitors' climbing strategies, adjustments they made to their initial strategies, and their climbing movement repertoire. Linear regressions revealed significant relations between the climbers' bouldering performance (number of completed boulders and failed climbing attempts) and their climbing strategy suitability, their strategy adjustments following their first attempts at the boulders, and their climbing movement repertoire. Findings underpin previous research that mastering competitive bouldering is associated with climbers' ability to develop appropriate climbing strategies relative to the climbing movements of boulders, physical constraints, and motor skills. Findings furthermore reinforce the mouvement repertoire paradigm and the inherently related conceptual framework of the matching theory; climbers who exhibited better bouldering performances were characterised by a superior climbing movement repertoire, enabling them to quickly process visual sensory input and identify meaningful climbing movement patterns during boulder previewing.

Original research article

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Profiling of expert bouldering routesetters

Julian Henz[1], Xavier Sanchez[2,3,4], Daniel Memmert[1], and Jerry Prosper Medernach[1,5]

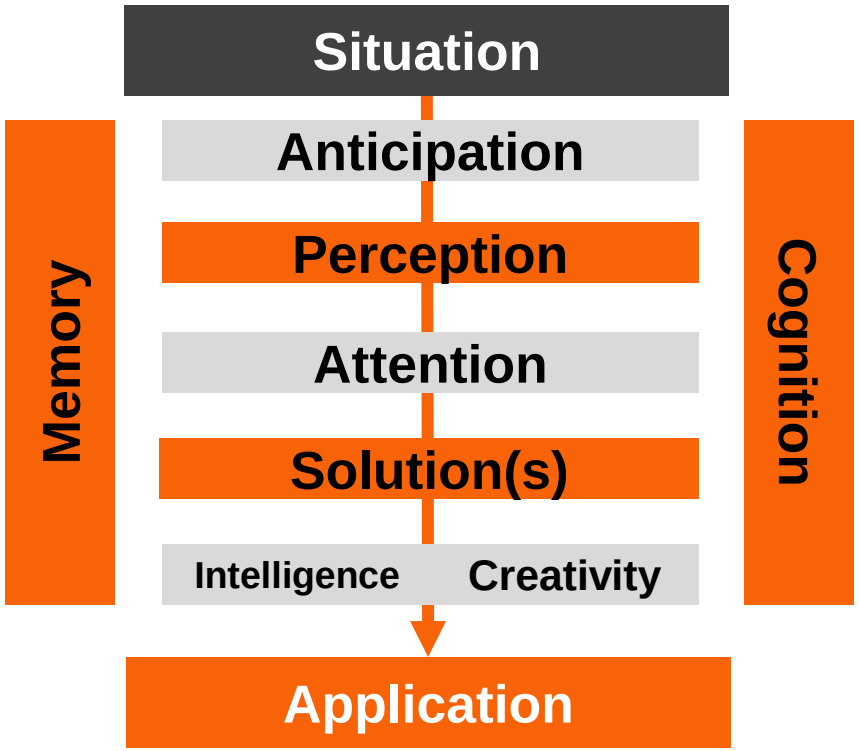
Abstract

Introduction: Bouldering is an Olympic discipline that takes place on low-height climbing structures known as boulders. Routesetters play a critical role in bouldering; they design and set boulders to be climbed, which must be original, safe to climb and adapted to climbers' levels. Considering the critical role routesetters play to keep the present success and ensure the future development of bouldering, the purpose of this study was to profile expert routesetters by identifying relevant key skills they possess and examining specific strategies they use when designing boulders.

Methods: Seventy-eight expert routesetters completed an online survey structured in eight sections that assessed the following: perceptual–cognitive skills; soft skills; motor skills; climbing skills; welfare; safety and difficulty; climbing holds and wall features; and climbing movement diversity and boulder styles.

Results: Among fundamental skills experts identified, most relevant to routesetters were possessing a broad climbing movement repertoire, the ability to develop several climbing strategies for one boulder, forecasting of climbing movements, climbing-specific decision-making and creativity, self-reflection, teamwork, dealing with negative feedback, technical skills and general fitness. Furthermore, most relevant specific routesetter skills and strategies appeared to encompass the ability to design boulders that account for climbers' skill levels and safety, to adapt to the constraints of climbing gyms, to make optimal use of climbing wall features and to design versatile climbing movements.

Conclusion: The expert routesetters' profile comprises fundamental and specific skills and strategies that enable them to design target-oriented boulders with versatile climbing movements for different levels whilst accounting for climbers' welfare.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Tweet

Psychological Aspects of Elite Performance in New Olympic Disciplines: The Case of Climbing

› written by **Xavier Sanchez**, **Julian Henz**, **Cécile Martha** & **Jerry Prosper Medernach**

Editor: Lisa Musculus-Schönenborn
Editorial assistant: Sofia Calderon

This article has also been translated into German and French.

In recent years, sports that have traditionally been practiced as recreational and non-competitive have been added in the official Olympic program. For example, climbing is on the Olympic program for Paris 2024 and Los Angeles 2028. This article provides an up-to-date overview of the relevant psychological aspects of climbing that are important for performance. We also discuss how sport psychology can contribute to current and future challenges in Olympic climbing.

Over the past two decades, extreme sport-related recreational outdoor activities, such as alpinism and mountaineering, have evolved into competitive mainstream sporting disciplines. The continuous development of climbing as a competitive sport has contributed to its international growth in popularity since its first World Championships in 1991. Today, over 25 million people climb and it is included in the Olympic program.

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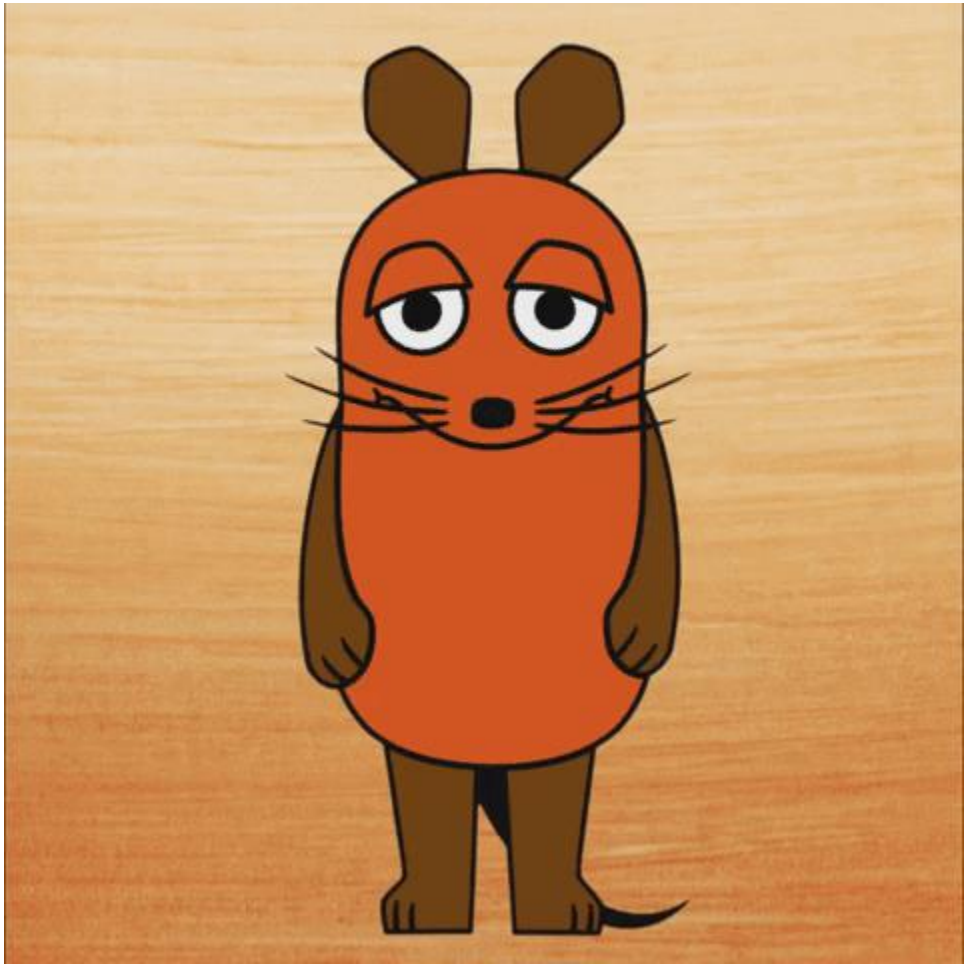

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