

Route Setting in Indoor Bouldering

Julian Henz^{1*}, Jerry Prosper Medernach¹², Daniel Memmert¹

¹ German Sport University Cologne (Institute of Exercise Training and Sport Informatics, German Sport University Cologne, Germany)

² École Nationale de l'Éducation Physique et des Sports (Ministry of Sport, Luxembourg)

Introduction

In the past decade, climbing and bouldering have gained considerable popularity. The inclusion of indoor bouldering in the Tokyo 2020 Olympic Games, the increasing number of bouldering events, and the ongoing expansion of climbing facilities have contributed to bouldering evolving from an adventurous outdoor activity to a mainstream competitive and recreational sport. The design of artificial boulders is crucial to ensure audience-friendly and fair bouldering competitions, long-term skill acquisition, and inclusive boulders that are accessible to a wide range of climbers.

Method

We implemented an online survey to examine what characteristics and features appeal to climbers, and according to which criteria they select the boulders in daily training sessions, or when practicing indoor bouldering as a recreational activity. To this end, 2081 participants completed a questionnaire based on the route setting recommendations by Godoffe (2017) and Neumann (2019), rating the relevance of the optical characteristics, the difficulty, the movement demands, the characteristics of the bouldering wall, and the safety aspects when choosing a boulder. The questionnaire included an interval-scaled five-point Likert scale (5: I totally agree; 4: I somewhat agree; 3: I neither agree nor disagree; 2: I somewhat disagree; 1: I totally disagree). The chi-square goodness-of-fit test was used to determine differences between the expected and observed frequencies by categorizing the participants' responses into three groups (i.e., category 1: I agree; category 2: I neither agree nor disagree; category 3: I disagree) with quasi-metric variables (i.e., percentages for each category are indicated in brackets). Furthermore, an ANOVA was calculated to analyze differences between the study groups. Based on their IRCRA scores, participants were assigned to the novice (NOV, $n = 97$), the intermediate (INT, $n = 677$), the advanced (ADV, $n = 978$), the elite (ELI, $n = 297$), or the world-class group (WCL, $n = 32$).

Results

Participants indicated that the optical characteristics (69.7%; 21.1%; 9.2%; 3.8 ± 0.9 ; $p < .001$; $\omega = .78$), the difficulty (81.8%; 14.8%; 3.4%; 4.1 ± 0.7 ; $p < .001$; $\omega = 1.04$), and versatile climbing movements (84.3%; 13.0%; 2.7%; 4.1 ± 0.8 ; $p < .001$; $\omega = 1.09$) are relevant for them when choosing a boulder. In this context, they reported being most attracted by the technical style which is characterized by slow-paced and balancing climbing movements, wobbly body positions, and technically demanding foot placement (61.6%; 24.8%; 13.6%; 3.7 ± 1.0 ; $p < .001$; $\omega = .61$), followed by the finger strength style defined by controlled climbing movements that require maximum grip strength (56.0%; 26.9%; 17.1%; 3.6 ± 1.0 ; $p < .001$; $\omega = .50$), and

the athletic style that is distinguished by dynamic and powerful climbing movements in which upper body strength is decisive (44.4%; 22.8%; 32.8%; 3.2 ± 1.2 ; $p < .001$; $\omega = .26$). The parkour style with dynamic, whole-body running, jumping, and swinging movements was found to be rather unpopular (29.0%; 25.4%; 45.6%; 2.8 ± 1.2 ; $p < .001$; $\omega = .26$). Furthermore, the characteristics of the bouldering wall (76.6%; 15.0%; 8.4%; 3.9 ± 0.9 ; $p < .001$; $\omega = .92$) and the safety aspects of a boulder (54.1%; 25.2%; 20.6%; 3.5 ± 1.1 ; $p < .001$; $\omega = .44$) were also found to be relevant for them when choosing a boulder. As shown in Table 1, the relevance of these criteria varies depending on the performance level of the climbers.

Table 1

The relevance of the different boulder characteristics separated by the performance level.

Item	NOV	INT	ADV	ELI	WCL
Optical characteristics are relevant	$3.7 \pm 1.0^{4b;5c}$ [3.5, 3.9]	$3.8 \pm 0.9^{4b;5b}$ [3.7, 3.8]	$3.8 \pm 0.9^{4b;5b}$ [3.7, 3.8]	$4.0 \pm 0.9^{1b;2b;3b}$ [3.9, 4.1]	$4.3 \pm 0.7^{1c;2b;3b}$ [4.0, 4.5]
	$F(4,183) = 6.95$; $p < .001$; $r = .105$				
Grade of difficulty is relevant	$4.4 \pm 0.6^{2b;3b;4b}$ [4.3, 4.5]	$4.2 \pm 0.7^{1b;3a}$ [4.1, 4.2]	$4.0 \pm 0.8^{1b;2a}$ [4.0, 4.1]	4.1 ± 0.8^{1b} [4.0, 4.2]	4.3 ± 0.9^{ns} [4.0, 4.6]
	$F(4,2076) = 7.95$; $p < .001$; $r = .122$				
Varied movements are relevant	$3.6 \pm 0.9^{2c;3c;4c;5c}$ [3.4, 3.8]	$4.1 \pm 0.7^{1c;4a}$ [4.1, 4.2]	4.2 ± 0.7^{1c} [4.1, 4.2]	$4.3 \pm 0.7^{1c;2a}$ [4.2, 4.4]	4.3 ± 0.9^{1c} [3.9, 4.6]
	$F(4,179) = 12.79$; $p < .001$; $r = .173$				
Technical style is popular	3.7 ± 1.1^{ns} [3.5, 3.9]	$3.8 \pm 1.0^{3a;4b}$ [3.8, 3.9]	3.7 ± 1.0^{2a} [3.6, 3.8]	3.6 ± 1.1^{2b} [3.4, 3.7]	3.5 ± 1.2^{ns} [3.0, 3.9]
	$F(4,179) = 4.33$; $p = .002$; $r = .095$				
Athletic style is popular	$2.2 \pm 0.9^{2b;3c;4d;5d}$ [2.0, 2.4]	$2.8 \pm 1.9^{1b;3b;4c;5c}$ [2.7, 2.9]	$3.3 \pm 1.2^{1c;2b;4b;5c}$ [3.3, 3.4]	$3.8 \pm 1.0^{1d;2c;3b}$ [3.7, 4.0]	$4.1 \pm 1.0^{1d;2c;3c}$ [3.8, 4.5]
	$F(4,185) = 87.08$; $p < .001$; $r = .350$				
Parkour style is popular	$2.5 \pm 0.9^{3b;4b;5c}$ [2.3, 2.7]	$2.7 \pm 1.0^{4b;5c}$ [2.6, 2.8]	$2.8 \pm 1.2^{1b;4b;5c}$ [2.7, 2.9]	$3.1 \pm 1.3^{1b;2b;3b}$ [3.0, 3.3]	$3.6 \pm 1.4^{1c;2c;3c}$ [3.0, 4.1]
	$F(4,181) = 10.71$; $p < .001$; $r = .148$				
Finger strength style is popular	$2.6 \pm 0.9^{2b;3c;4d;5d}$ [2.4, 2.8]	$3.1 \pm 1.0^{1b;3b;4d;5d}$ [3.1, 3.2]	$3.7 \pm 1.0^{1c;2b;4b;5c}$ [3.7, 3.8]	$4.2 \pm 0.8^{1d;2d;3b}$ [4.1, 4.3]	$4.5 \pm 0.6^{1d;2d;3c}$ [4.3, 4.7]
	$F(4,187) = 134.49$; $p < .001$; $r = .424$				
Wall characteristics are relevant	4.0 ± 0.8^{ns} [3.8, 4.1]	3.9 ± 0.9^{ns} [3.9, 4.0]	3.9 ± 0.9^{ns} [3.9, 4.0]	3.9 ± 1.0^{ns} [3.8, 4.0]	4.3 ± 1.0^{ns} [3.9, 4.6]
	$F(4,181) = 1.12$; $p = .348$; $r = .048$				
Safety aspects are relevant	3.7 ± 1.0^{5c} [3.5, 3.9]	3.6 ± 1.0^{5c} [3.5, 3.6]	3.5 ± 1.1^{ns} [3.4, 3.5]	3.4 ± 1.1^{ns} [3.3, 3.5]	$2.7 \pm 1.4^{1c;2c}$ [2.2, 3.2]
	$F(4, 180) = 5.35$; $p < .001$; $r = .114$				

Note. Results (1: *I totally disagree*; 5 = *I totally agree*) are indicated as $M \pm SD$, followed by the 95% CI. An alpha level (two-tailed) of $p < .05$ was used to determine statistical significance. ANOVA with Games-Howell post-hoc comparisons were conducted to determine between-group differences. Differences are reported as superscript characters, with numbers indicating the groups (¹NOV; ²INT; ³ADV; ⁴ELI; ⁵WCL), and letters reporting either non-significant results (^{ns}) or the effect size (^a $r < .1$; ^b $.1 \leq r < .3$; ^c $.3 \leq r < .5$; ^d $r \geq .5$).

Discussion

Drawing on the results of our survey, route setters should diversify their strategies to guarantee the accessibility of indoor bouldering to a wide range of climbers. Accordingly, boulders for beginners should include a concise arrangement of climbing holds that are visually appealing, easy to grasp, and that guide the climber through the boulder. Furthermore, the indication of the difficulty and climbing movements of a boulder seems to be helpful for inexperienced climbers to choose boulders that suit their abilities. Particularly vertical bouldering walls should include sufficient unchallenging boulders, and route setters should avoid uncontrolled climbing movements in high boulders. On the other hand, when setting for experienced climbers, route setters should account for visually appealing boulders (e.g., optical appearance, eye-catching holds) with versatile climbing movements to ensure sensation seeking and long-term skill acquisition. Athletic and finger strength style boulders with climbing movements that are difficult to interpret at first glance seem to appeal to experts, while parkour style boulders should be set with moderation, despite its popularity in competitive bouldering. Finally, regardless of their bouldering skills, climbers seem to be mostly attracted by technical style boulders.

References

- [1] Godoffe, J. (2017). My keys to Route Setting. Stains: Dejalink.
- [2] Neumann, U. (2019). The evolution of modern route setting. In: M. Polig, & M. Hilber (Eds.), Routesetter (pp. 34-39). Bressanone: Vertical-Life s.r.l.

Short Biography

Julian Henz is a scientific researcher at the Institute of Exercise and Sports Informatics of the German Sports University in Cologne. In 2021, he graduated in sport science and mathematics (M.Ed.), and he is currently investigating in his Ph.D. the determinants of route setting in indoor bouldering. In addition to his research, he is working as a professional route setter and is the managing director of the Get High Routesetting GmbH.