

CONCERNS REGARDING SPORT CLIMBING COMPETITION FORMAT AND SCORING SYSTEM: WHO'S SUFFERING?

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Abstract

Sport climbing, which made its Olympic debut at the 2020 Summer Games, generally consists of three separate disciplines: speed climbing, bouldering, and lead climbing. However, the International Olympic Committee (IOC) only allowed one set of medals per gender for sport climbing at Tokyo 2020. As a result, the governing body of sport climbing, rather than choosing only one of the three disciplines to include in the Olympics, decided to create a competition combining all three disciplines. In order to determine a winner, a combined scoring system was created using the product of the ranks across the three disciplines to determine an overall score for each climber. In this work, the sport climbing scoring system is evaluated through simulations to investigate its general features such as the advancement probabilities given certain placements and the sensitivity of the scoring system to small changes. In addition, analyses of historical climbing contest results are presented and real examples of violations of the independence of irrelevant alternatives are illustrated. Finally, this work finds evidence that the current competition format is putting speed climbers at a disadvantage.

BACKGROUND

- Sport climbing at Tokyo 2020 Olympics overview

| | |
|-------------------------|---|
| 3 disciplines | speed, bouldering, lead |
| 1 set of medals | for each gender competition |
| 1 combined score | multiplying 3 disciplines' ranks (best score = lowest score) |
| 2 rounds | qualification (20 climbers) final (8 climbers) |

- **CONCERNS** regarding this “triathlon” combined format:
 - Climbers often specialize in one event
 - “That is like asking a middle distance runner to compete in the sprint. Speed climbing is a sport within our sport.” - Lynn Hill, former US Climber.
 - “Honestly, the people that will suffer the most are the ones that focus only on speed climbing. Those skills/abilities don't transfer as well to the other disciplines.” - Mike Doyle, US Climber.

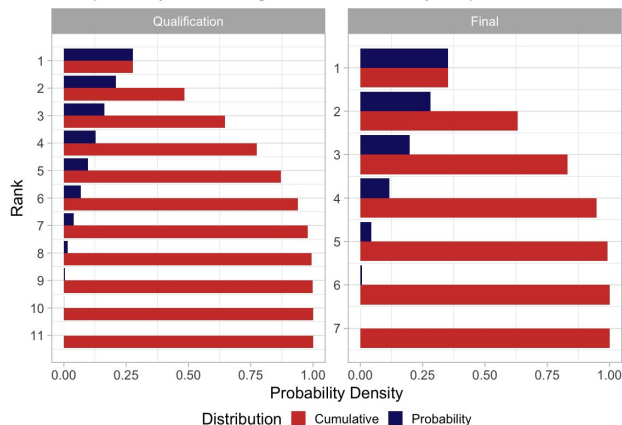
METHODS

- **Data:** Past competitions (Olympics, World and Continental Championships), obtained from Wikipedia and event websites, with features:
 - Overall rank and 3 discipline ranks
 - Skill stats: speed time, bouldering tops, lead holds
- **Analysis**
 - Conduct **simulations** to examine properties of the rank-product scoring system
 - Probabilities of making the finals and winning a medal, given certain conditions
 - How sensitive is this system to a small change?
 - Analyze **real data** from past competitions
 - Rank correlation analysis between overall rank and the discipline ranks
 - How can a disqualification affect the overall winning outcome?

SIMULATIONS

* Assuming uniform ranks

Rank probability distribution, given a climber wins any discipline

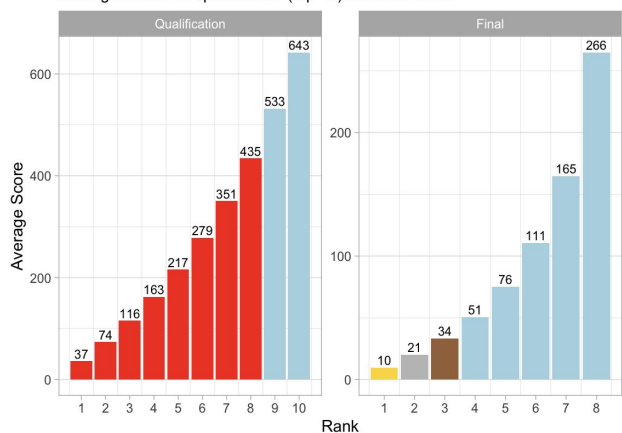


PROPERTIES

If a climber wins any discipline

- As a qualifier, they are very likely to make top 8 (99.5%)
- As a finalist, there's a 85.0% chance of winning medal (top 3)

Average scores for qualification (top 10) and final ranks



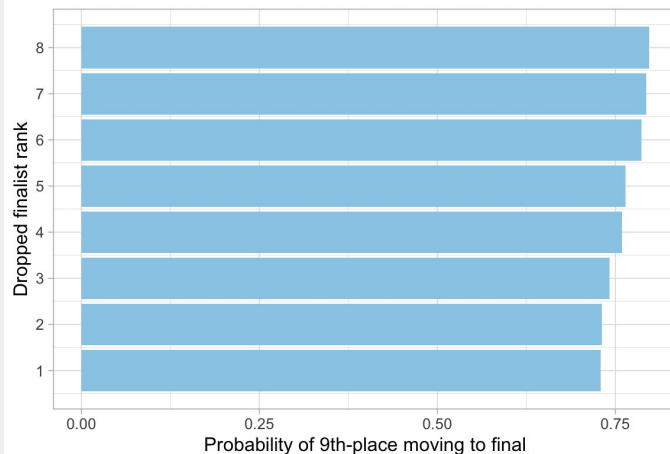
Average target scores

- For qualifiers: 435 to make top 8
- For finalists: 10, 21, 34 to win gold, silver, bronze

SENSITIVITY ANALYSIS

- At Tokyo 2020, finalist B. Mawem withdrew from the finals
 - However, no replacements were selected to replace him.
 - Should 9th-ranked qualifier A. Migos have been next in line to fill in the missing finalist spot?
 - If we removed Mawem and reranked the remaining climbers based on their qualification results:
 - Migos would remain 9th
 - However, 10th-ranked J.Chon would move up to 8th
- Question: How often does 9th ranked climber get selected as a replacement if a finalist is out and the scores are recalculated?

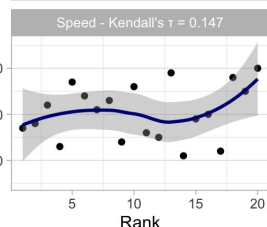
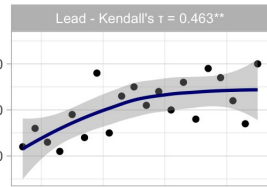
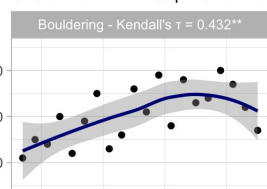
For each dropped rank, there's about a 3/4 chance that 9th-place gets selected as final replacement (from simulations)



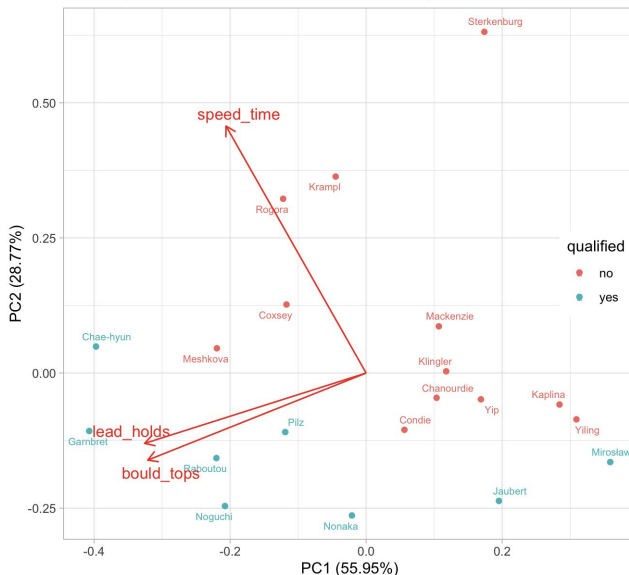
DATA ANALYSIS

- **Rank correlation (Kendall's tau):** Lead and bouldering ranks are more highly correlated with overall rank than speed
- **PCA:** PC1: lead + bouldering; high and positive correlation
PC2: speed; separated from the other two disciplines

Overall Rank vs Discipline Ranks



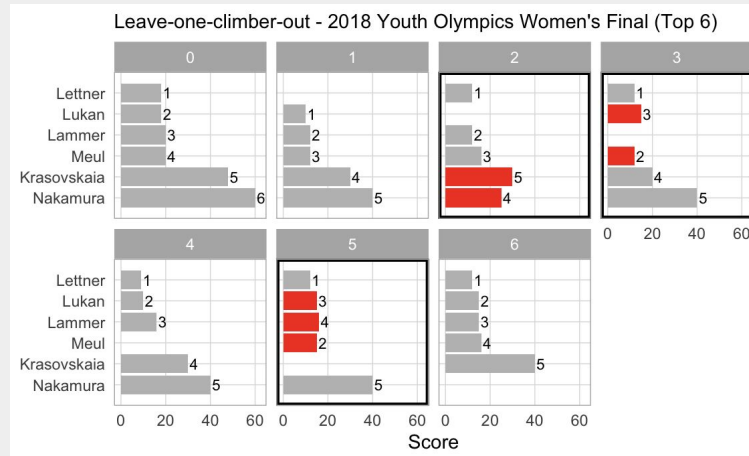
PCA Biplot for Women's Qualification at Tokyo 2020



→ Combined format gives speed climbers a huge disadvantage!

SUGGESTION: 1 set of medals for speed; bouldering and lead can be combined into 1 set (confirmed for Paris 2024)

Leave-one-climber-out Analysis



- Panel number = rank of left-out climber (0 is the original rankings)
- Black panel border = case with change in rank orderings
- Red-filled bar = climber with rank change

- Could a disqualification affect the orderings of finalists/medalists?
- This has a connection with the **independence of irrelevant alternatives (IIA)**
- IIA: rank orderings should not change if a losing candidate is removed and the scores are re-calculated
- Panel 5 is an example of violation of the IIA
- **If 5th-place climber (Krasovskaia) was excluded, climber with actual rank 4 (Meul) would move up to 2nd!!!**

→ There's dependency on irrelevant candidates, which is another issue of this scoring system.