Deutsche Sporthochschule Köln
German Sport University Cologne

Introducing Indoor Bouldering to High School Students: A Self-Reported Perception Analysis of Various Short-Term Training Regimen

Presentation at the 23rd Annual International Conference on Education

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Medernach, Dieudonné, & Memmert (2021) – German Sport University Cologne – Institute of Exercise Training and Sport Informatics

Introduction

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Indoor bouldering

- increasingly popular
- recreational and competitive climbing discipline
- included in the 2021 Olympic Games in Tokyo
- undertaken without ropes
- on low-height artificial walls
- landing mats to minimize injury risks

source: https://www.adidas-rockstars.com/

Bouldering in PE

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- Versatile full body movements ➲ motor & coordinative skills
- Creativity and problem-solving ➲ individual solutions to solve a task
- Safety ➲ fatal accidents are less common at low height
- No introductions to belaying techniques ➲ safety & activity rate
- Possibility of quickly swapping between various bouldering tasks
- Tasks can be repeated multiple times in a short time
- Direct contact with teachers who can provide immediate feedback
- Small groups with students of different ability levels

State of Art

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- Considerable increase of research during the last two decades (e.g., White & Olsen, 2010: Time-motion analysis in competitive bouldering; Macdonald & Callender, 2011: Athletic profile of accomplished bouldering athletes; Medernach et al., 2015: Fingerboard to increase grip strength and endurance; Medernach et al, 2020: The use of system walls to increase strength and endurance)
- Focus on performance factors, physiological determinants, and sport-related risk factors (Woollings, Mckay, and Emery 2016; López and Sitko 2019; Saul et al. 2019)
- No studies on how to introduce indoor bouldering as a recreational and physical education activity
- Non-scientific publications involve a variety of exercises and game forms but lack methodological instructions

Purpose of the Study

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- Investigation of various short-term bouldering regimen to introduce indoor bouldering to novice athletes
- How non-experienced high school students perceive the bouldering regimen
  - Popularity of indoor bouldering
  - Activation during the lessons
  - Improvement of the bouldering ability levels
  - Increase of technical skills
- How experienced sports teachers and climbing coaches perceive the bouldering regimen

Method

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high school students
- n = 285
- 24 distinct schools
- no previous experiences

sports teachers
- n = 22
- experience: 10.7 ± 8 years
- ability level: intermediate

climbing coaches
- n = 6
- experience: 10.2 ± 4 years
- ability level: advanced

Method

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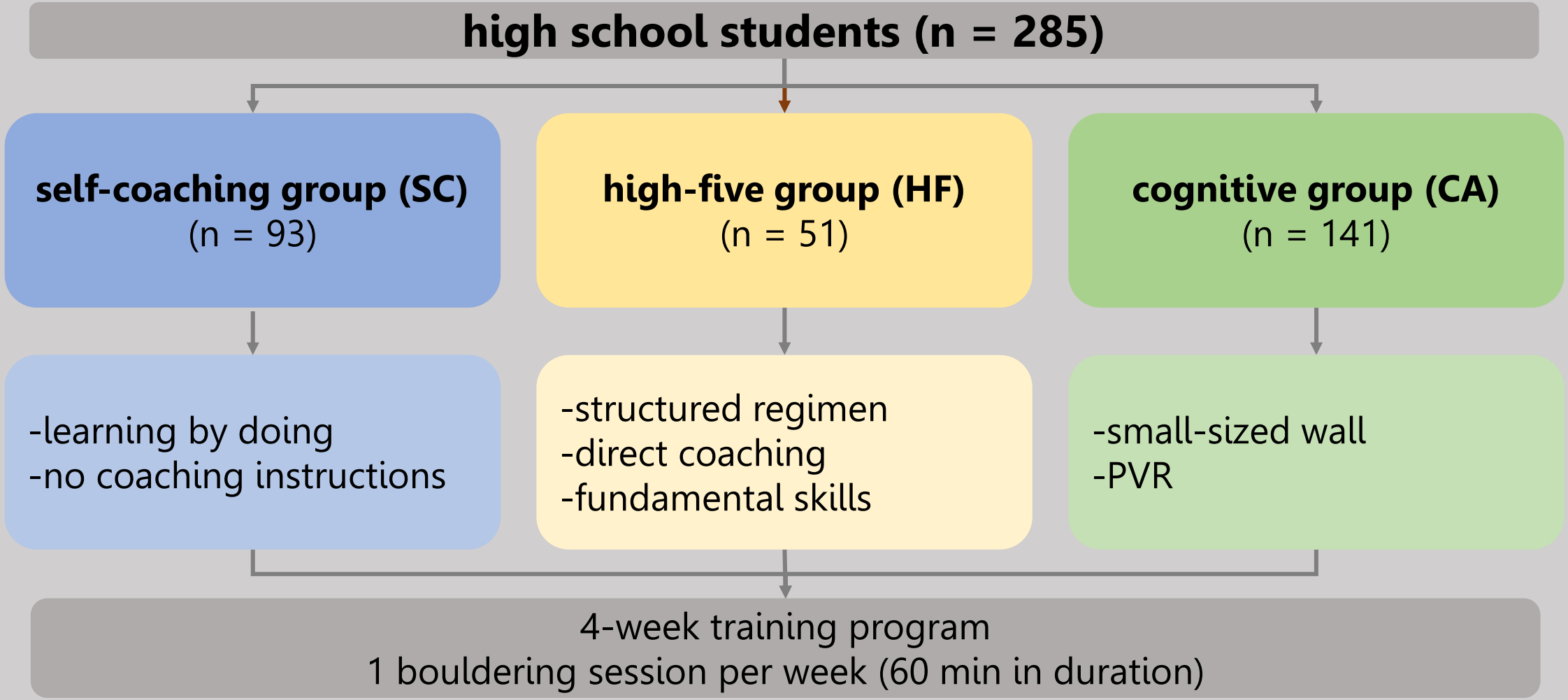

Self-Coaching Approach

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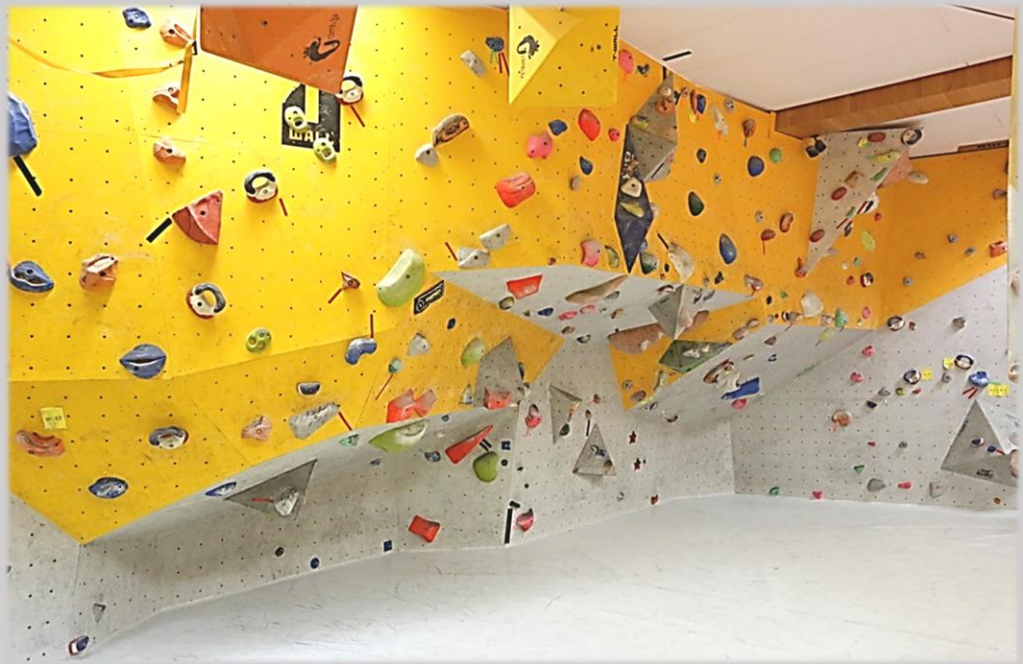
- Participants spent four lessons on a conventional bouldering wall
- Short introduction to the sport-specific rules and safety instructions
- Students discovered indoor bouldering by using the tick-list method
- Self-teaching
- Non-structured
- Without any guided instructions



High-Five Approach

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- Participants introduced to bouldering by using the high-five model
- The high-five model consists of a methodological approach to learning bouldering
- It includes five fundamental movement skills, which are mandatory for long-term learning progresses and are related to each other in a consecutive matter
- Structured and guided learning sequences

lesson	topic
lesson 1	grasping the handholds
lesson 2	placing the feet
lesson 3	locating the fundamental body position
lesson 4	moving upwards by the whole-body wave
lesson 5[1]	making dynamic movements

[1]excluded from the investigation

Lesson 1: Grasping the handholds

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lesson	topic	contents
lesson 1	grasping the handholds	(1) bouldering and touch three different handholds before grasping (2) bouldering and collect the coloured magnets distributed on the handholds (3) bouldering and collect the tape strips distributed on the wall (4) +2: A climbs two moves, B repeats the two moves and adds two more moves (5) laser-tech: handholds are marked with a laser pointer (6) practical application: bouldering ten different tasks

Coaching instructions:
-perception (i.e., location, orientation, shapes) of the handholds
-spread the legs / open hips (i.e., fundamental body position)

Lesson 2: Placing the feet

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lesson	topic	contents
lesson 2	placing the feet	(1) monkey circle: draw a circle with the foot around each foothold before placing the food (2) silent mouse: bouldering without making any noise (3) foot control: bouldering with a hacky sack on the foot (4) touch the footholds: bouldering and touch five different footholds before placing the foot (5) change of foot: bouldering and change of foot each time before placing the foot (6) practical application: who will be the first person to ascent the twelve bouldering tasks?

Coaching instructions:
-spread the legs (i.e., ad hoc fundamental foot position)
-fundamental positions of the feet (i.e., placing the foot with the toe / ball of the foot)
-precise positioning of the foot (i.e., no noise)
-both feet have contact with the wall
-place the feet first, then grasp the handholds

Lesson 3: Body position

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lesson	topic	contents
lesson 3	locating the fundamental body position	(1) follow the numbers: bouldering and following the numbers from one to five which are distributed on the wall (2) traverse: bouldering from the left to the right and vice-versa (3) swimming noodle: bouldering through the swimming noodles that are fixed on the wall (4) hula-hoop boulder: bouldering through the hula-hoops that are fixed on the wall (5) blind nut: bouldering with keeping the eyes closed (6) practical application: team-cup - which team will be first to ascent in total 30 bouldering tasks?

Coaching instructions:
-positioning of the body in the plumb line (i.e., navel under the handhold)
-low body position (i.e., straight arms)
-positioning of the body close to the wall (i.e., through spreading the legs)

Lesson 4: Whole-body wave

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lesson	topic	contents
lesson 4	moving upwards by the whole-body wave	(1) wall clap: bouldering and hit the wall with one hand before grasping the handhold (2) clap your hands: bouldering and clap the hands before grasping (3) one-arm-monkey: bouldering with one arm (4) practical application: monkey boss - who is the first person to ascent six easy, four intermediate, and two strenuous bouldering tasks?

Coaching instructions:

-performing the whole-body wave accurately is not mandatory
-purpose: learn performing the movements by using momentum (vs. statically)
-the whole body is involved in performing the movement
-body wave: First move away from the wall, then move back the knees, the hip, and finally the upper body
-handholds are grasped in the dead point (i.e., smooth grasping)

Lesson 5: Dynamic movements

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lesson	topic	contents
lesson 5	making dynamic movements	1) slow motion: bouldering at slow motion (2) change of pace: bouldering up at slow motion, down at normal speed, and again up at full speed (3) speed-bouldering: solving bouldering tasks at full speed (4) under ten seconds: bouldering problems with a maximum of ten seconds to the top handhold (5) practical application: bouldering competition

Coaching instructions:
-bouldering as fast as possible
-use momentum through backswing
-high speed will impact the movement quality negatively (e.g., foot placement)

Cognitive Approach

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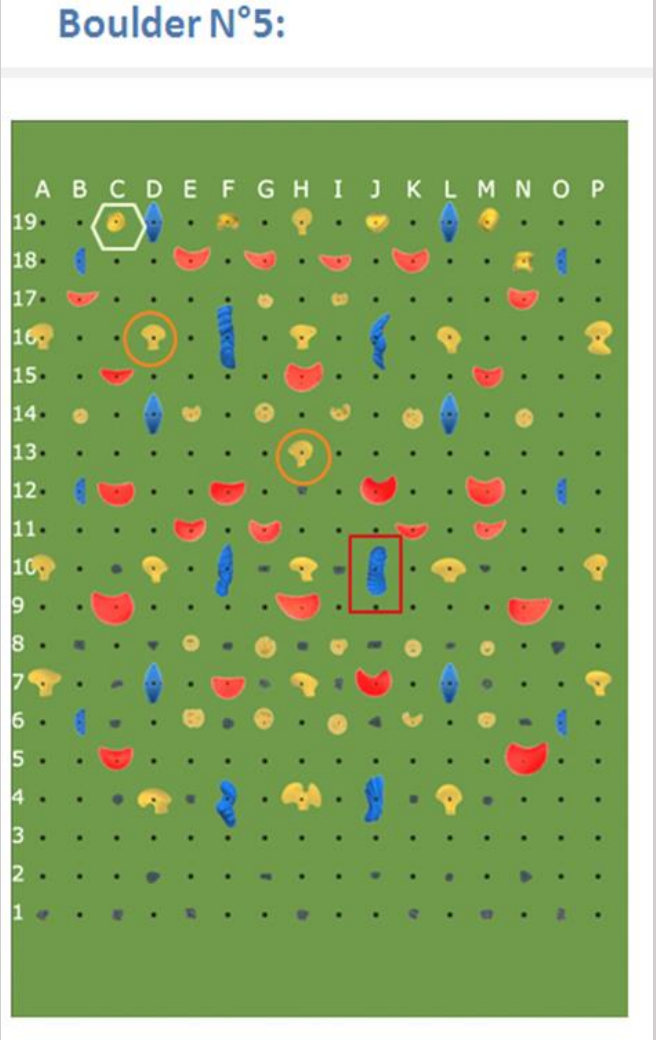
- Participants spent four lessons on a Schoolboard (T-Wall GmbH)
- Coordinate system that indicates the handholds of each task
- Students were guided through the fundamental movement skills by using methodological learning cards
- The methodological learning cards included various topic-specific tasks that had to be ascended by the students
- Students had to perceive the task, generate problem-solving options, and subsequently recall the task while solving it



Data collection

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- 26-item reliable and valid questionnaire
- 5-factor data structure
- Including the factors:
  - Popularity of bouldering
  - Activation during the lessons
  - Motivation during the lessons
  - Improvement of the bouldering ability levels
  - Increasement of the technical skills
- Four-level Likert scale (1 = *I totally disagree*; 2 = *I somewhat disagree*; 3 = *I somewhat agree*; 4 = *I totally agree*)
- Features were considered as quasi-metric variables due to the progressive scaling

Results: Overall

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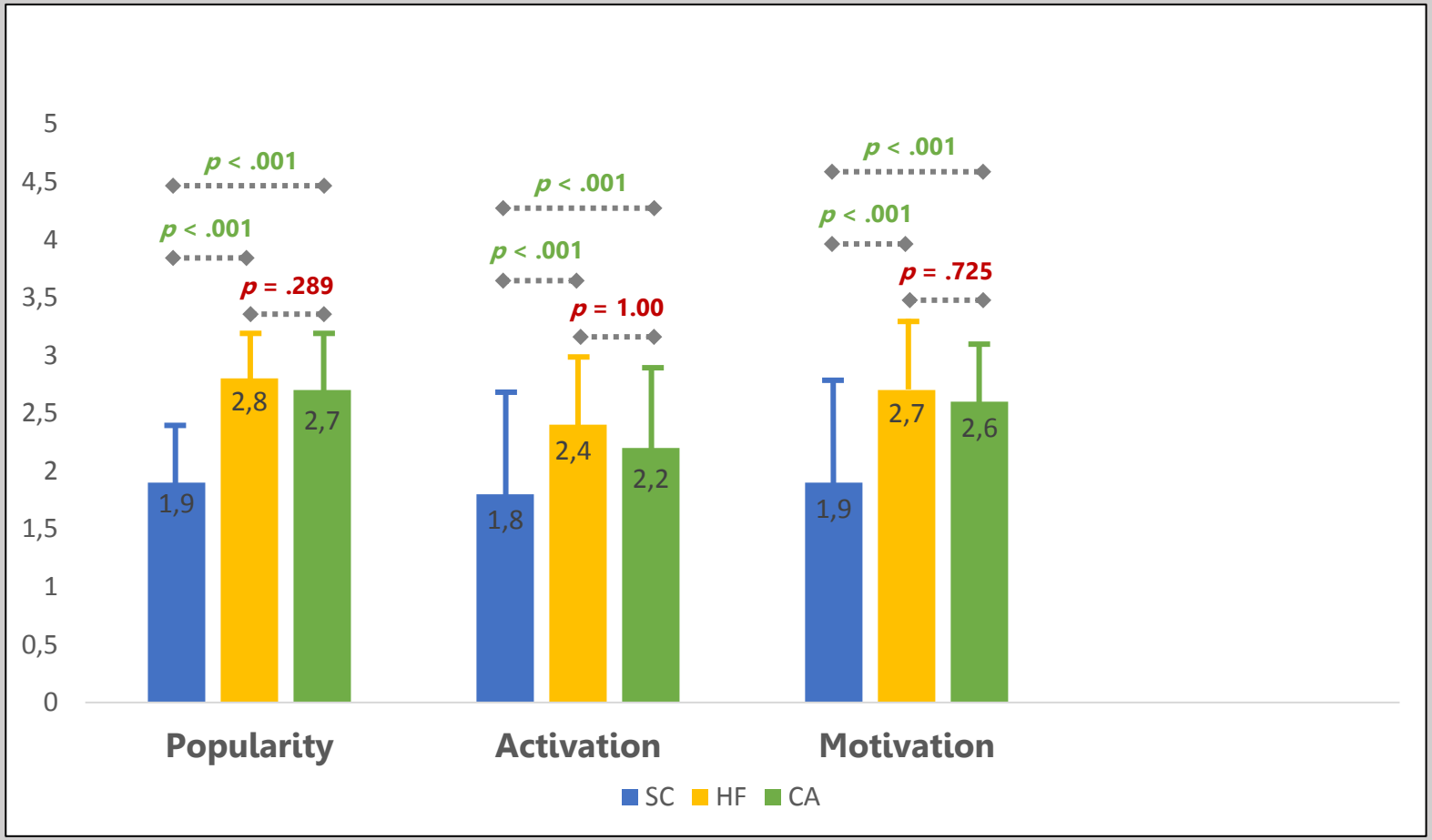
Study results (selection) for the factor 1: 'popularity of indoor bouldering', the factor 2: 'activity rate during the lessons', the factor 3: 'motivation during the lessons', the factor 4: 'bouldering ability level', and the factor 5: 'technical skills level'. Results are indicated for all athletes regardless of the training method they were allocated.

	factor	item	unity	*'I completely disagree'*	*'I somewhat disagree'*	*p-value*	*'I somewhat agree'*	*'I completely agree'*
factor 1: popularity of indoor bouldering								
'I enjoyed indoor bouldering'	10	%	0.0	5.2	$p < .001$	44.6	50.2
		n	0	15		127	143
'indoor bouldering was fun and exciting'	17	%	1.4	6.0	$p < .001$	31.9	60.7
		n	4	17		91	173
'I will continue to practice indoor bouldering in the future'	22	%	5.6	13.3	$p < .001$	33.3	47.8
		n	16	38		95	136
factor 2: activity rate during the lessons								
'I have practiced many bouldering tasks'	11	%	1.0	19.7	$p = .003$	44.6	34.7
		n	3	56		127	99
factor 3: motivation during the lessons								
'I was motivated to practise bouldering'	12	%	2.6	12.9	$p < .001$	29.8	54.7
		n	7	37		85	156
factor 4: bouldering ability level								
'my bouldering ability level has increased during the lessons'	13	%	0.0	9.5	$p < .001$	42.1	48.4
		n	0	27		120	138
factor 5: technical skill level								
'my technical skills have increased during the lessons'	19	%	3.5	12.3	$p < .001$	40.3	43.9
		n	10	35		115	125

Results are given as percent and number.

Results: Group comparisons



Results: Group comparisons

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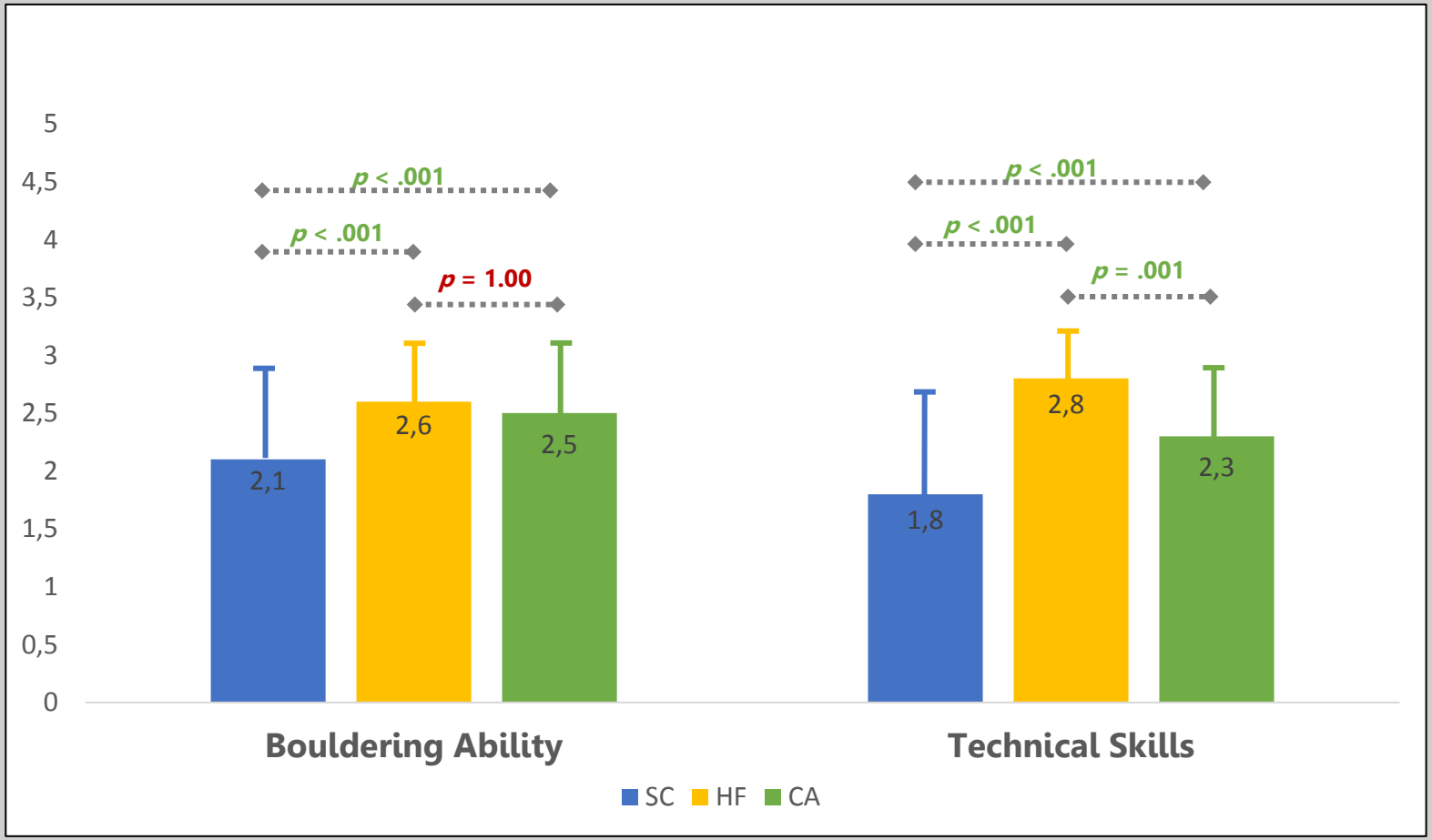

Results: Teachers & Coaches

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	SC	HF	CA	SC	HF	CA
	sports teachers			climbing coaches		
Popularity	2.5 ± 0.4 $p < .001$	**4.1 ± 0.2** ***p* < .001**	1.9 ± 0.4 $p = .025$	**4.2 ± 0.4** ***p* = .980**	4.1 ± 0.2 $p < .001$	1.9 ± 0.3 $p < .001$
Motivation	2.3 ± 0.5 $p = .890$	2.4 ± 0.4 $p = .245$	2.0 ± 0.4 $p = .350$	4.0 ± 0.4 $p = .747$	**4.3 ± 0.2** ***p* < .001**	1.8 ± 0.4 $p < .001$
Activation	3.8 ± 0.7 $p = .354$	4.1 ± 0.5 $p = .980$	4.0 ± 0.6 $p = .460$	3.9 ± 0.7 $p = .650$	4.1 ± 0.4 $p = .870$	4.0 ± 0.5 $p = .460$
Ability Level	2.4 ± 0.4 $p < .001$	**4.2 ± 0.5** ***p* = .020**	3.4 ± 0.4 $p = .001$	3.2 ± 0.5 $p = .001$	**4.2 ± 0.5** ***p* = .320**	4.0 ± 0.4 $p = .025$
Technical Skills	2.5 ± 0.3 $p < .001$	**4.1 ± 0.5** ***p* < .001**	2.5 ± 0.5 $p = 1.00$	3.4 ± 0.4 $p < .001$	**3.9 ± 0.5** ***p* = 1.00**	3.8 ± 0.5 $p < .001$

Conclusion

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- Participants described indoor bouldering, regardless of the study groups they were allocated to, as an enjoyable, exciting, and motivating physical activity
- They reported, following the four-week regimen, significant improvements of the bouldering ability and technical skills levels
- Indoor bouldering consists of a worthwhile alternative to more conventional everyday physical education activities

Conclusion

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- The applied methodological learning approach seems to influence the **popularity** of bouldering, the **motivation** of students, the self-perceived physical **activity** of the students during the physical education lessons, the self-perceived short-term **learning processes**, and the self-perceived acquisition of sport-specific skills

Conclusion

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- Since the acquisition of fundamental sport-specific movement skills is pivotal to guarantee **long-term progressions**, introducing novice athletes and non-experienced students to indoor bouldering by using a task-oriented, **guided**, and structed training approach with **versatile movement demands** seems to be beneficial to foster motor learning progresses
- Sport-specific expertise and appropriate methodological learning approaches are more important than the dimensions of the bouldering facilities
- Potential of the cognitive approach to introduce indoor bouldering

Discussion

- Questions?

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