

ACUTE RESPONSE OF HANDGRIP STRENGTH, OXYGEN SATURATION, HEART RATE, AND TWO-POINT DISCRIMINATION AFTER ROCK AND ICE CLIMBING

Gürer, B. ⁽¹⁾, Özdal, M. ⁽¹⁾ and Akcan, F. ⁽¹⁾

⁽¹⁾ Gaziantep University, School of Physical Education and Sports, Gaziantep, Turkey. burakgurer27@gmail.com

⁽¹⁾ Gaziantep University, School of Physical Education and Sports, Gaziantep, Turkey. ozdalm@hotmail.com

⁽¹⁾ Gaziantep University, School of Physical Education and Sports, Gaziantep, Turkey. firatakcan@yahoo.com

Abstract

The aim of the preset study is determination to acute effects of rock and ice climbing on some strength, circulation, and tactile feeling features that could affect climbing performance when consider together, such as handgrip strength (HS), oxygen saturation (SpO₂), heart rate (HR), and two-point discrimination (TPD). For this purpose, 13 rock climbers and 16 ice climbers, that were climb at least ten years, participated in the study. HS, SpO₂, HR, and TPD measurements were performed before and after climbing. HS was measured with dynamometer, SpO₂ and HR were measured with pulse oximeter, and TPD measure was performed with two point discriminator. Climb groups had different subjects, and performed top point of climbing surface task (15-20 m). In order to defining statistical significance, 2x2 mixed factor ANOVA test and LSD correction were used. According to obtained data, right and left HS significantly decreased after rock and ice climbing, as similar ($p<0.05$). After rock climbing SpO₂ reduced, different from ice climbing ($p<0.05$). HR parameter showed, after both rock and ice climbing, significantly increment, similarly ($p<0.05$). TPD value decreased after rock climbing, but increased after ice climbing ($p<0.05$). HS difference of pre- and post-climbing, similarly, did not showed significant difference between ice and rock climbers ($p>0.05$). SpO₂, HR, and TPD alterations between pre- and post-climbing, there are significant difference between rock and ice climbing, favor of the rock climbers ($p<0.05$). In conclusion, it could be said that climbing can affect to handgrip strength, oxygen saturation, heart rate, and two-point discrimination tactile feel. For handgrip strength both rock and ice climbing show same effects, but oxygen saturation, and heart rate parameters negatively affect rock climbing, compared to ice climbing. Tactile resolution ability via two-point discrimination can clearly decrease after ice climbing.

Keywords: Circulation, Tactile, Power, Climbing

RÉPONSE AIGUË DE LA RÉSISTANCE À LA POIGNEE, DE LA SATURATION DE L'OXYGÈNE, DU RYTHME CARDIAQUE ET DE LA DISCRIMINATION À DEUX POINTS APRÈS LE ROCK ET L'ESCALADE DE GLACE

Résumé

Le but de l'étude pré-réglée est la détermination des effets aigus de l'escalade de roches et de glace sur certaines forces, circulations et sensations tactiles qui pourraient affecter la performance d'escalade en considérant ensemble, comme la force de la poignée (HS), la saturation en oxygène (SpO₂), le cœur taux (HR) et discrimination à deux points (TPD). À cet effet, 13 grimpeurs et 16 grimpeurs, qui ont grimpé au moins dix ans, ont participé à l'étude. HS, SpO₂, HR et TPD mesures ont été effectuées avant et après l'escalade. HS a été mesurée avec un dynamomètre, SpO₂ et HR ont été mesurés avec un oxymètre de pouls, et la mesure TPD a été réalisée avec un discriminateur à deux points. Les groupes de montée ont eu différents sujets, et ont exécuté le point le plus haut de la tâche de surface s'élevant (15-20 m). Afin de définir la signification statistique, un test ANOVA à facteur mixte 2x2 et une correction LSD ont été utilisés. D'après les données obtenues, les HS de droite et de gauche ont diminué de façon significative après l'escalade de roches et de glace, de la même manière ($p < 0,05$). Après l'escalade SpO₂ réduit, différent de l'escalade de glace ($p < 0,05$). Le paramètre HR a montré, après l'escalade de la roche et de la glace, une augmentation significative de la même manière ($p < 0,05$). La valeur de la TPD a diminué après l'escalade, mais a augmenté après l'escalade de glace ($p < 0,05$). De la même manière, la différence de SH avant et après escalade n'a pas montré de différence significative entre les grimpeurs de glace et de roche ($p > 0,05$). Altérations SpO₂, HR et TPD entre avant et après l'escalade, il existe une différence significative entre l'escalade de rocher et l'escalade de glace, faveur des grimpeurs ($p < 0,05$). En conclusion, on pourrait dire que l'escalade peut affecter la force de la poignée, la saturation en oxygène, la fréquence cardiaque et la sensation tactile de discrimination à deux points. Pour la force de la poignée, l'escalade de rocher et de glace montre les mêmes effets, mais la saturation en oxygène et les paramètres de la fréquence cardiaque affectent négativement l'escalade, par rapport à l'escalade sur glace. La capacité de résolution tactile par la discrimination à deux points peut nettement diminuer après l'escalade sur glace.

Mots clés: Circulation, Tactile, Puissance, Escalade

INTRODUCTION

Rock climbing is one of the nature sports, which is both a recreational sport and a competition sport [1]. Climbing technique is an important skill [2]. Climbing is a skill practice for difficult sections of areas. Also, climbing has a lot of injury risks. Grip strength is vital factor for eliminate to injury risks. Besides, tactile feeling is supportive factor for grip strength and feeling. Beside them, circulation parameters, such as oxygen saturation and heart rate, are indicator to climbing performance during climb. The aim of the preset study is determination to acute effects of rock and ice climbing on handgrip strength, oxygen saturation, heart rate, and two-point discrimination.

METHOD

Table 1: Descriptive parameters

		N	Min.	Max.	Mean	S.D.
Rock Climbers	Age	13	19.00	40.00	25.85	7.45
	Height		1.68	1.79	1.73	0.04
	Weight		61.00	85.00	69.07	6.16
	Climbing age		1.00	15.00	2.38	3.86
Ice Climbers	Age	16	26.00	54.00	36.94	7.24
	Height		1.70	1.87	1.78	0.05
	Weight		53.00	95.00	74.94	11.22
	Climbing age		1.00	20.00	5.75	6.35

Thirteen rock climbers (Climbing age: 2.38 ± 3.86 years) and 16 ice climbers (Climbing age: 5.75 ± 6.35 years) participated in the study (Table 1). Handgrip strength, oxygen saturation, heart rate, and two-point discrimination measurements were performed before and after climbing. Handgrip strength was measured with dynamometer, oxygen saturation and heart rate were measured with pulse oximeter, and two-point discrimination measure was performed with two point discriminator. In order to defining statistical significance, 2x2 mixed factor ANOVA test and LSD correction were used.

RESULTS

Table 2: 2x2 mixed factor ANOVA analysis with LSD correction of measured parameters of rock (13) and ice (16) climbers at pre- and post-climbing

			Mean	Std. Deviation
Right handgrip strength (kg)	Rock Climbers	Pre-climbing	42.38 ^a	9.11
		Post-climbing	37.63	10.03
		Difference		-4.75
	Ice Climbers	Pre-climbing	46.07 ^a	8.14
		Post-climbing	41.31	10.17
		Difference		-4.76
Left handgrip strength (kg)	Rock Climbers	Pre-climbing	40.31 ^a	9.48
		Post-climbing	36.04	10.00
		Difference		-4.27
	Ice Climbers	Pre-climbing	44.23 ^a	7.92
		Post-climbing	40.73	8.12
		Difference		-3.50
SpO ₂ (%)	Rock Climbers	Pre-climbing	98.23 ^a	.60
		Post-climbing	96.46	2.33
		Difference		-1.77 ^b
	Ice Climbers	Pre-climbing	94.69	4.08
		Post-climbing	94.31	3.50
		Difference		-0.38
Heart Rate (beat/min)	Rock Climbers	Pre-climbing	86.62	12.43
		Post-climbing	119.46 ^a	15.97
		Difference		32.84 ^b
	Ice Climbers	Pre-climbing	78.88	15.67
		Post-climbing	105.75 ^a	13.65
		Difference		26.87
Two point discrimination (mm)	Rock Climbers	Pre-climbing	.26 ^a	.10
		Post-climbing	.22	.11
		Difference		-0.04
	Ice Climbers	Pre-climbing	.41	.06
		Post-climbing	.54 ^a	.66
		Difference		0.13 ^b

a: significant difference between pre- and post-climbing. b: significant difference between climber groups

According to obtained data, right and left handgrip strength significantly decreased after rock and ice climbing ($p < 0.05$). After rock climbing SpO₂ reduced ($p < 0.05$). Heart rate parameter showed, after both rock and ice climbing, significantly increment ($p < 0.05$). Two-point discrimination value decreased after rock climbing, but

increased after ice climbing ($p < 0.05$). Handgrip strength difference of pre- and post-climbing did not showed significant difference between ice and rock climbers ($p > 0.05$). SpO₂, heart rate, and two-point discrimination alterations between pre- and post-climbing, there are significant difference between rock and ice climbing, favor of the rock climbers ($p < 0.05$).

DISCUSSION

In conclusion, it could be said that climbing can affect to handgrip strength, oxygen saturation, heart rate, and two-point discrimination tactile feel. For handgrip strength both rock and ice climbing show same effects, but oxygen saturation, and heart rate parameters negatively affect rock climbing, compared to ice climbing. Tactile resolution ability via two-point discrimination can clearly decrease after ice climbing.

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