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LETTER TO THE EDITOR

Climbers! Don't stretch your forearm muscles before climbing: Effect of static stretching on a finger strength in various grip positions

Grimpeurs ! N'étirez pas vos muscles de l'avant-bras avant de grimper : effets de l'étirement statique sur la force des doigts dans différentes positions de prise

KEYWORDS
Climbing;
Static stretching;
Grip strength

1. Introduction

Climbers are frequently forced to hold features of a natural rock or artificial holds that are small or at least hard to grab because of their shape and inclination. Therefore, being able to exert high finger strength is frequently a real key to succeed on a route or a boulder problem, especially during competition, when climbers have only one try (in lead climbing) or short time (in bouldering) at their disposal. One of the factors that could have detrimental effect on a strength performance is static stretching, probably due to mechanical as well as neurological factors, like loss of muscular stiffness, decrease in neuromuscular activation and EMG activity [1]. As the knowledge on the effects of acute static stretching on grip strength of climbers is lacking, the aim of this study was to investigate if stretching of forearm flexors alters fingers strength measured in specific climbing conditions and with different types of holds.

2. Summary of facts and results

Ten members of a sport climbing team in one of the bouldering gyms in Katowice, aged 21—38 ($M = 26.00 \pm 5.68$), including six males (mean weight 68.18 ± 8.56 kg, mean height 178.17 ± 5.64 cm) and four females (mean weight 55.38 ± 3.81 kg, mean height 165.75 ± 2.63 cm) with a sport climbing experience 4.5—17.00 years ($M = 8.94 \pm 3.78$) participated in the study. Their mean climbing level expressed in UIAA metric system was 9.36 (± 1.15) RP and 8.55 (± 0.94) OS, so they could be classified as ''elite''.

The finger strength was assessed by the Dead Hang method on three kinds of grips and holding positions: an open and a closed (pinch) grip on the edge (wooden campus rung 25 mm wide), an open grip on the sloper (100 mm diameter wooden hemisphere) and a pinch (polyethylene hold with a pear-like cross section; the widest and the thinnest dimensions were, respectively, 4.5 mm and 3.1 mm).

Participants were tested on two separate workouts with one-day rest in between. During the first one the effect of stretching on a crimp and open grip on the edge were assessed. Climbers hung on the rung with an additional load ca. 85% max attached to a harness. Both hangs (open and pinch) were separated by a 1.5 min break. During the second workout an effect of stretching on hanging on slopers and pinches was assessed. As these kinds of holds are difficult on their own, both were performed only with climbers' bodyweight. Climbers were allowed to use chalk to enhance the grip. As characteristics of the chalk differ slightly between manufacturers, all participants were provided with the same chalk.

All sessions were preceded by a 15 min warm-up. Because of various preferences of climbers in relation to warm-up schedules, participants were encouraged to perform a warm-up on their own, having in their minds that they should be optimally prepared for hanging on challenging holds. The stretching protocol consisted of two exercises aimed at finger flexors and finger extensors, both lasting 30 s: bending wrist upwards or downwards and then pressing them with another hand towards the forearm. Rest intervals between a warm-up and pre-stretch hangs, between pre-stretch hangs and stretching exercises and, finally between stretching and post-stretch hangs were 3 minutes.

To reveal differences between pre- and post-stretch conditions paired *t*-tests were calculated. To assess the magnitude of the differences Cohen's *d* effect size measures were conducted. Data were analysed using Statistica 12 (Statsoft, PL).

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Table 1 Time of dead hangs in seconds (*M* and *SD*) pre- and post-stretching of forearms.

	Pre-stretch	Post-stretch	Difference	*d*
Edge crimp	5.16 (1.10)	1.91 (1.84)	$t_{(8)} = 5.24$, $P = 0.001$	2.27
Edge open	4.57 (0.81)	2.64 (1.47)	$t_{(8)} = 3.96$, $P = 0.004$	1.73
Sloper	33.30 (17.49)	28,70 (16.12)	$t_{(9)} = 0.61$, $P = 0.548$	0.29
Pinch grip	43.00 (10.12)	28.90 (10.82)	$t_{(9)} = 3.01$, $P = 0.008$	1.42

Mean load with which climbers performed MaxHangs on the edge were 33.33 kg (*SD* = 15.86) for an open grip and 40.00 kg (*SD* = 13.64) with for a crimp. In both cases, mean hang durations dropped significantly after stretching, respectively, $t_{(8)} = 3.96$, $P = 0.004$, $d = 1.73$ and $t_{(8)} = 5.24$, $P = 0.001$, $d = 2.27$. Detailed data are presented in Table 1. Taking into account individual scores, except for one subject who achieved the same result as before stretching all participants worsened their hang time post stretching.

Significant worsening of the results was also observed in the pinch grip ($t_{(9)} = 3.01$, $P = 0.008$, $d = 1.42$) in which hang time dropped $M = -14{,}10$ s (−43.00 to −28.90). Surprisingly, the difference between the pre- and post-stretching within the open grip on the sloper was insignificant. However, this result was influenced by one male subject who improved his hanging-time after stretching—contrary to the remaining ones who decreased their performance from −2 to −16 s ($M = -6.44$). When the ''negative respondents'' were compared the difference between both conditions was significant: $t = 4.62$, $P = 0.002$, $d = 0.39$.

3. Discussion

We found a significant and strong negative effect of a static stretching of forearm muscles on all kinds of grips. Dead hang time on the edge dropped by ca 63% in a close, by ca 42% in an open grip and on a pinch grip by ca 33%. Only in the case of a sloper no effect was observed. However, the result was distorted by one 8c male climber who improved post stretching, while the others decreased their performance, ca by about 19%. It is hard to interpret his exception in the light of the obtained data. The results of the present study support the findings according to which performing a static stretching prior to activity may decrease strength or power [2,3], extending their meaning on performance of small muscles in a climbing-specific context. However, there are many variables that may have an effect on the potential changes in performance, like stretch durations (longer stretches — especially those lasting 60 s or longer — increase the likelihood of detrimental effects on strength, power or speed), time passing from stretching to the target performance and sequencing of stretching in the warm-up protocol [4]). Also, when after a static stretching a general warm-up or dynamic stretching are performed, the negative effect of the former seems not to occur [5]. In our study, finger strength tests were performed shortly after stretching, but it should be taken into account that — as our experiences as a rock and competition climbers imply — that is what some climbers do, although not necessarily for 30 s as in our study. Such long stretches for many climbers may represent rather a developmental stretching routine than a pre-climb warm-up, so in future studies effects of different stretches should be assessed and the time of returning forearm muscles into initial functionality should be established.

Disclosure of interest

The authors declare that they have no competing interest.

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