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Vibration Training in Indoor Bouldering: Effects on Strength and Endurance

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Introduction

Indoor bouldering (IB) consists of low height climbing sequences with grip strength and endurance as key factors. Limited research has been conducted on IB and less is known regarding the effectiveness of sport-specific training methods. Therefore, the aim of our study was to investigate the use of fingerboards in the presence (VB) and absence (FB) of vibration stimulation to increase grip strength (GS) and climbing time to exhaustion (CTE).

Methods

Thirty-four male boulderers (25±4 y; 1.78±0.1 m; 70±5 kg; 6±2 yrs climbing; 7b Fb mean ability) were randomly allocated to a 4-week VB (n=11), FB (n=11), or IB (n=12) training regimen with three sessions of 150 min per week. VB and FB involved a Transgression fingerboard, fixed at head height on a vibration plate (Power Plate Classic; 2 mm amplitude; 40 Hz frequency) for vibration stimulation in VB. IB involved bouldering at individual ability level. Subjects had equal climbing abilities, comparable years of climbing experience, and similar body characteristics. The investigation took place in-season to avoid erroneous increases caused by lower physical states during off-season.

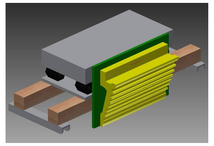

Figure 1. Vibrationboard of the study.

Pre- and posttests with a 48 h rest prior data collection involved body weight (BW), perceived physical state (PEPS), handheld dynamometry to assess GS, and the repeated ascent until exhaustion of a 4 m high bouldering route with 10 bolt-on holds to determine CTE. For GS, the highest score out of three attempts and an exact recovery of 5 min between attempts were ensured, whereas only one attempt was recorded for CTE. The sport-specific tests were chosen to guarantee high test apparatus access and easily reproducible test criteria.

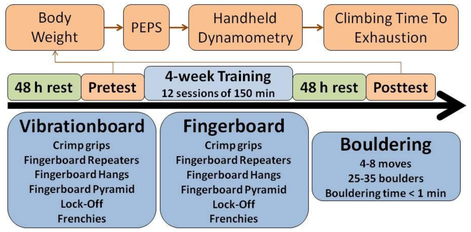

Figure 2. Study design with training contents.

Results

All 23 subjects successfully completed the four-week investigation. Multivariate analysis of variance (MANOVA) with Bonferroni post-hoc comparison found significant (p < .001) GS increases in VB (+7.3%) and FB (+5.0%), but not in IB (+2.6%; p = .109). In addition, significant greater GS increases were found in VB compared to IB (p = .045) with, however, no significant (p = .656) differences between VB and FB.

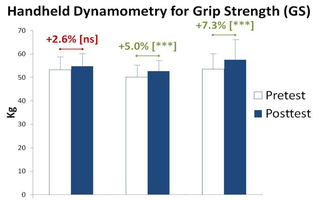

Figure 3. Grip strength for IB, HB, and VB in pre- and posttest.

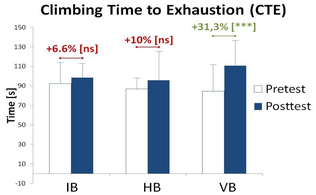

Figure 4. Climbing time to exhaustion in pre- and posttest.

With respect to grip endurance, climbing time to exhaustion (CTE) increased significantly after the four-week regimen in VB (+31.3%; p < .001), but not in FB (+10%; p = .288) and IB (+6.6%; p = .298). Moreover, no significant (p > .05) changes in BW and PEPS were observed between the pre- and posttests and the training groups, so that GS and endurance gains were not attributable to body weight decreases or external influencing factors.

Discussion

According to the main findings of our study, four-week VB and FB regimen are highly effective in increasing GS. Both involve isolated grip positions grasped without feet contacting the ground to ensure a high-intensity training stimulus to the point of muscle failure, making GS gains to occur in a relatively short period of time. In contrast, IB involves multiple grip sizes and shapes, so the isolation of single grip positions cannot occur to the same extent as with VB and FB. Moreover, mean gains of approximately 26 s for CTE indicate that VB is highly effective in increasing grip endurance. The different findings between VB and FB may be explained by the additional vibration stimulus in VB, whereas the limited number of climbing moves may explain the insignificant findings in IB. The main advantages of VB and FB are (a) low space requirements, (b) easy access, (c) isolated training on a variety of grip positions, and (d) highly intensive training stimuli at individual ability level.

Conclusion

- VB and FB are highly effective in increasing GS.
- VB is highly effective in increasing CTE.

References

La Torre A, Crespi D, Serpiello FR, Merati G (2009). Heart rate and blood lactate evaluation in bouldering elite athletes. J Sports Med Phys Fitness, 49(1), 19-24. Macdonald JH, Callender N (2011). Athletic profile of highly accomplished boulderers. Wilderness Environ Med, 22(2), 140-143. White DJ, Olsen PD (2010). A time motion analysis of bouldering style competitive rock climbing. J Strength Cond Res, 24(5), 1356-1360

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