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Title: **Sports climbing once a week improves balance, fatigue and cognitive function in multiple sclerosis (MS)**

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Purpose

MS affects mainly young adults, still capable of working. Even though immunomodulating drugs slow down disease progression, the loss of functional capacity severely handicaps patients with MS. Although exercise reduces secondary complications in patients with MS, Motl (2005) has shown that MS patients are less physically active than non-disabled subjects. Sports Climbing (SC) is new in therapy of neurological patients and intrinsically highly motivating. Thereby, multidimensional skills in SC allow targeting various symptoms of patients with MS individually. This study aimed to investigate if SC once a week improves balance, fatigue and cognitive function in patients with MS.

Patients and Methods

We report on 27 MS-patients randomized into SC-group [n=12] and control-group (cg) [n=15] with an Expanded Disability Status Scale (EDSS) 1-6.5. The SC-program was performed over 20 sessions of two hours within 6 month on consecutive Saturdays. Criteria for exclusion are 'attendance less 18 sessions' or 'relapse during intervention'. Each session was adjusted individually and documented. Controlled top rope climbing and safety-standards in the SC-program were ensured. Data were collected for cognitive function (PASAT=Paced Auditory Serial Addition Test), dynamic balance (MFT S3Check [Multifunktionale Trainingsgeräte GmbH]), steady balance (COP=Center of Pressure [Kistler force platform]) and fatigue (WEIMuS=Würzburger Erschöpfungsinventar).

Results

EDSS decreased in SC-group (n=10) from to 5.5 [IQR 2.8; 6.5] to 4.3 [2.6; 6.5], p=0,068 whereas we had no changes in cg (n=14) 4.0 [pre 2.5; 6.0; post 2.4; 6.0], p=0,157. Significant improvements were found in all mental and physical tests in the SC-group from pre- to post-test. WEIMuS totally decreased in SC-group from 36.0 [25.75; 46.50] to 17.5 [1.75; 32.50], p=0.011 whereas results in cg increased from 26.0 [5.75; 45.25] to 27.0 [15.25; 34.25], p=0.550. The PASAT ascended significantly in SC-group from 44.0 [27;50] to 50.5 [38,5;57,25], p=0.028; slightly in control-group from 46.0 [38;51] to 49.0 [42.5; 55.5], p=0.270. Steady and dynamic balance improved in SC-group; S3Check (n=7) revealed (pre / post) for stability index 5.8 [5.3; 6.4] / 5.6 [4.5; 6.6], p=0.046 and sensomotoric index 5.1 [4.4;6.3] / 4.6 [4.0;5.0], p= 0.051 vs cg stability index 5.0 [4.8;6.5] / 5.5 [4.5;6.4], p=0.752 and sensomotoric index 4.6 [3.7;5.6] / 4.3 [3.7;5.3], p=0.612.

Conclusions

SC-intervention improves or stabilizes mental as well as physical functioning in MS-patients. Regular sport participation, such as SC should be recommended to patients with MS.