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THE IMPACT OF SPORT CLIMBING ON SOME MORPHOLOGICAL CHARACTERISTICS AND MOTOR ABILITIES IN CLIMBERS OF 14 YEARS OF AGE

INTRODUCTION

Sport climbing is a young branch. It started in 1985, when first larger international competition was organised in Italy (Leskošek, 1990). Slovenia was not far behind the world. The first national championship in former Yugoslavia took place in Osp in 1988 (Kokalj, 1990). Sport climbing was started mountaineers. In Marz 1990, the first climbing class was organised in the elementary school in Radovljica by the Mountaineering Society of Radovljica. The participants were school children. The school children in Kamnik, Jesenice, Tržič, Škofja Loka, Žiri, etc. soon followed. At some schools, the classes were led by physical education teachers, at others by mountaineers, who were educated to train. In any case they mostly followed their instincts. Nowadays, the situation has improved to some extent. The number of graduates at the Faculty of Sports has increased, and some amateur trainers and instructors of sport climbing were educated as well. Sport climbing is new and attractive sport, which makes it popular to people of all ages. Due to the simplicity of movement (phylogenetically climbing is older than walking) young as well as older people can do it. Climbing involves factors of physical condition (strength, endurance, mobility) as well as technique (coordination) (Goddard in Neumann, 1993). Those factors are strongly connected to the climbing success (Ulaga, 1999). Apart from motor abilities, morphological characteristics of a climber (Watts, 1999), are important for successful sport climbing. In our research, muscle power, endurance, anaerobic and aerobic strength and capacity as well as morphologic characteristics determine the profile of a climber.

Involvement in different sports can change the level of motor abilities (Pavlič, 1972; Jerončič, 1974). However, the development of motor abilities and morphologic characteristics can be affected by training programmes (Vauhnik, 1984; Kovač in Štihec, 1988). Of an utmost importance are the skills of a trainer. Strel et al. (1985) discovered that children who were trained by physical education teachers showed better development of motor abilities than their peers, who trained under the guidance of low grade teachers. In spite of better educated teachers, the results of Physical Education Chart from the years 1986 and 1987 of primary and secondary school children show distinct drop in the shoulder rim and hand endurance, as well as the increase of skin fold thickness on the upper arm (Strel, 1988). The most worrying fact is 20 % drop in shoulder rim and arm endurance each ten years (Strel, 1996). Lately, this has stabilized (Kondrič in Šajber, 1997).

Sport climbing is a sport in which arms are involved to a high extent. It would be interesting to know, if climbing can somehow interfere in the development of morpholo-

gical characteristics and motor abilities. Climbing is thought of as one of natural forms of movement as well as a sport branch, which includes all phases of training process and uses different training instruments and methods.

METHODS

Pattern of variables

In order to identify changes which were due to biological changes in climbers and nonclimbers (in climbers probably also due to their activity) all tests of the physical education chart (Table 1) were used (Strel et al, 1984), which were realized within the frame of physical education chart testing at primary schools.

Table 1: Tests of the physical education chart

ATV	Body height
ATT	Body mass
AKG	Upper arm skin fold
TAP	Tapping with better arm
SDM	Standing broad jump
PON	Polygon backwards
DT	Sit-ups
PRE	Bend and touch on a bench
VZG	Bent-arm hang
T60	60 m run
T600	600 m run

Pattern of subjects

a) Experimental group

Included 11 sport climbers (age 14,08±0,4 years), who had properly and entirely filled physical education chart and visited climbing class at least once a week for the last year.

b) Control group

Included 72 nonclimbers - peers of the climbers (age 14, 15±0, 5), who were not involved in any sports for the last year prior to the final testing (with the exception of regular physical education as part of the education process).

With climbers and nonclimbers being school peers, the impact of different forms of physical education on their morphological and motor abilities was avoided.

Data processing methods

The test results were processed with statistical package SPSS: arithmetic means and standard deviations calculated for all variables of the initial and final state.

- The differences of single groups of initial and final stage were tested with t-test for dependent patterns.

- Analysis of covariance was used for the determination of differences between final states among the groups.

RESULTS AND DISCUSSION

In morphological characteristics, the results of ATV and ATT tests show minimal differences between the experimental and control group (Table 2). The results of those two tests show that biological age of climbers and nonclimbers were very similar. Higher biological age means also physical over maturity, which is often an important factor in choosing talents for single sports (Helsen et al., 2000). For this study, this influence can be neglected, as the climbers and nonclimbers nearly identical chronological age (climbers 14, 08±0, 4 years and nonclimbers 14, 15±0, 5 years). Somewhat larger differences are in the initial part of the test Skin fold thickness of the lower arm, which is better for climbing (climbers have lower skin fold thickness) and can be a result of natural selection. It is likely that those children decided for sport climbing, who were prior involved in another sport in which they used arms. In the initial stage of motor tests nonclimbers achieved somewhat lower results than climbers. This shows that children with lower results in motor ability tests probably never were athletes and were properly classified by their teachers into the control group. Further analysis of the results showed that the majority of morphologic characteristics and motor abilities of climbers as well as nonclimbers had changed. The changes were in the direction of better results and can be contributed to physical development of children in one year and the impact of a year of regular sport activity. Almost all changes are also statistically significant (Table 2). It is shown that somewhat better test results (AKG, PON, PRE) were achieved by climbers (Table 2). Nonclimbers achieved larger differences than climbers in torso lifting and 600m run. The results of the analysis of covariance showed statistically significant (P=0,011) differences in PON test, while in AKG test the difference was close to statistical significance (P=0,086), as well as in PRE test (P=0,063) (Table 2). These results are in consistence with the expectations, as the climbers had improved after a year long training more than their peers nonclimbers especially in those morphological characteristics and motor abilities that are important for successful sport rock climbing (Goddard in Neumann, 1993; Watts, 1999). It is important to know that being involved in a sport means also general and specialized conditional training, not only climbing itself. With only climbing, mobility can hardly be increased. Among the motor tests, only tests DT and VZG deviate, the results of which show statistically significantly improvement in the nonclimbers (Table 2). Far more climbers than nonclimbers, in percents, achieved the best (limiting) time of the VZG test. In the initial state, 4 % of nonclimbers and 16 of climbers achieved 120 s, the difference is 12 %, while in final state 9 % of nonclimbers and 26 % of climbers achieved this result. The difference increased to 17 %. The VZG test in which the best result is limited to 120 s is not suitable for the monitoring of the improvement in climbers.

Table 2: Basic statistical parameters of single tests from physical education charts in climbers and nonclimbers.

TEST	XA_p	XA_n	SD_p	SD_n	n_p	n_n	P_p	P_n	P_{AKV}
ATV1 (body height)	1594,74	1580,19	86,18	85,63	19	72			
ATV2	1670,00	1659,58	86,25	83,49	19	72	,000	,000	,607
ATT1 (body mass)	464,21	471,81	65,13	107,41	19	72			
ATT2	532,68	546,25	74,87	91,64	19	72	,000	,000	,427
AKG1 (upper arm skin fold)	9,26	11,31	2,38	4,98	19	72			
AKG2	7,74	10,50	1,69	4,87	19	72	**,026**	,147	,086
TAP1 (tapping with better arm)	40,05	39,51	7,74	6,14	19	72			
TAP2	44,68	43,17	7,25	6,18	19	72	,004	,000	,322
SDM1(standing broad jump)	207,68	193,29	17,56	16,83	19	72			
SDM2	220,37	208,11	19,75	20,08	19	72	,000	,000	,643
PON1 (polygon backwards)	108,21	114,65	17,77	32,32	19	72			
PON2	94,58	110,47	19,81	26,81	19	72	**,001**	,118	**,011**
DT1 (sit-ups)	49,37	42,74	10,12	9,68	19	72			
DT2	51,63	45,64	9,16	9,12	19	72	,288	**,008**	,210
PRE1 (bend and touch on a bench)	44,84	43,64	8,81	6,17	19	72			
PRE2	47,89	44,53	7,37	6,75	19	72	**,008**	,220	,063
VZG1 (bent-arm hang)	69,63	52,58	34,83	32,49	19	72			
VZG2	83,11	63,69	27,82	31,51	19	72	,051	,000	,156
T601 (60 m run)	95,68	101,60	6,48	8,23	19	72			
T602	90,42	94,72	5,64	7,41	19	72	,000	,000	,695
T6001 (600 m run)	129,05	143,69	8,94	23,39	19	72			
T6002	125,79	137,43	10,41	20,62	19	72	,196	**,022**	,225

Legend: XA_p-arithmetric mean climbers, XA_n-arithmetic mean nonclimbers, SD_p-standard deviation climbers, SD_n-standard deviation nonclimbers, n_p-number of climbers, n_n-number of nonclimbers, P_p-statistical significance climbers, P_n-statistical significance nonclimbers, P_{AKV}-statistical significance at the analysis of covariance.

The results of our study is very optimistic as they show that sport rock climbing is a sport, which can affect the development of those morphological characteristics and motor abilities that were in decline in school children in the last decades (Strel, 1988; Strel 1996). This was also the aim of our research. We are aware, however, that the sample was not randomly chosen, included relatively small number of subjects, and that in future it would be sensible to include the entire Slovenian population of the studied group as reference assessment of the control group at least in the morphological part, which does not depend so much on training process.

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The objective of our research was to identify the impact of sport climbing on some morphologic characteristics and motor abilities in climbers. The sample group consisted of 19 climbers, who trained climbing for one year beside their regular physical education after the initially survey was made, and 72 nonclimbers, who's only sport activity was their regular physical education. At the time of the test, climbers as well as nonclimbers were 14 years of age. The measurement included all the variables from the Physical education chart. Data were processed with statistical programme package SPSS for Windows. The result of analysis of covariance show that after a year long period of sport climbing statistically significant differences were shown in the results of t he test Polygon backwards in favour of the experimental group. It is also possible to observe a trend towards better results of the experimental group in the tests Skin fold thickness of the upper arm and Bend and touch on bench. The nonclimbers achieved larger differences than climbers in torso lifting and 600 m run.

Keywords: *sport climbing, morphology, motor abilities.*

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CRNOGORSKA SPORTSKA AKADEMIJA

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