Effects of winter survival training on selected motor indices

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Summary

Study aim: To assess the effects of prolonged winter survival activities of moderate workouts on selected motor skills in male participants of survival instructor training course.

Material and methods: A group of 11 physical education students, participants of a survival course camp for instructors, aged 21 – 25 years, participated in the study. They were examined 3 times: before starting the course (Day 1), on the following morning – after a 12-h night training when the participants were deprived of sleep (Day 2) and 24 h later, after a 6-h sleep and survival activities lasting all day (Day 3). At the end of the course all the participants were assessed by a single 10-point scale. In the mornings of all 3 days the participants were subjected to the following tests: 15-m straight run, shuttle run 3×5 m, 15-slalom run, 15-m squat, computer-aided co-ordination test, maximum handgrip, 50%-handgrip and corrected 50% handgrip.

Results: Running velocity on Day 3 was significantly (p<0.05) decreased in relation to the previous days but a running performance index computed from the standardised values of all running tests did not decrease and on Day 2 was even significantly (p<0.05) higher than on Day 1. No significant between-day differences were found for the visual co-ordination test and for handgrip strength indices despite exhausting workloads applied.

Conclusions: Although the applied tests did no fully reflect the real performance of subjects under the winter survival conditions, it seems that engaging soldiers in consecutive military actions without an adequate recovery should be avoided whenever possible in order to improve the execution of strenuous tasks.

Key words: Survival – Motor co-ordination – Forced sleep deprivation

Introduction

Adventure racing and survival competitions lasting from several hours to several days have gained in popularity. The participants have to overcome ground and water obstacles, to climb, to move on foot or on a bicycle in unknown surroundings with or without maps. Thus, an excellent physical and psycho-emotional preparation is needed to endure and complete such events. The motor/coordinative structure of survival tasks resembles that typical of military actions. Two categories of military survival can be discerned: knowledge and psychomotor competence associated with surviving in isolation from own units and from other people, and that associated with surviving under the conditions of combat [15]. Military survival training contains prolonged physical loads – mainly relocations (fitness training), shooting under diverse conditions, overcoming terrain obstacles, executing precise manipulatory tasks under acute concentration (co-ordination training) [10,15]. Contemporary soldiers are expected to be all the time capable to undertake intense exertions [1] and to exhibit a versatile fitness resembling that of polyathletes [3]. Computer-aided tests for assessing co-ordination skills have been widely used [7,17,19]. However, under harsh ambient and terrain conditions, motor tests seem to be more appropriate.

The aim of this study was to assess the effects of prolonged winter survival activities of moderate workouts on selected motor skills in male participants of survival instructor training course.

Material and Methods

A group of 11 physical education students, participants of a survival course camp for instructors, volunteered to participate in the study. Their age ranged 21 – 25 years, body height 168 – 188 cm and body mass 55 – 86 kg. The measurements were performed 3 times: before starting the course (Day 1), on the following morning – after a 12-h night training when the participants were deprived of sleep (Day 2) and 24 h later, after a 6-h
sleep and survival activities lasting all day (Day 3). At the end of the course all the participants were assessed by a single 10-point scale.

The night activities consisted of crossing the river by boats twice and a 30-km orienteering march in a diversified terrain; the latter included carrying an injured man on the stretcher for several hours – this engaged 4 participants working in one-hour shifts. Other night activities included stealthy moving, looking for a suitable landing ground for planes, constructing ground-air signs, setting campfire and dressing wounds. Mean heart rate was equal to 104 bpm.

Day activities included constructing shelters, getting one’s bearings without maps, running field chase games, preparing meals, etc. These lasted till the evening and the participants were not sure whether the activities would continue overnight or not. The ambient night temperature was equal to -4°C and to +2°C during the day. All activities were run and supervised by licensed survival instructors.

The following measurements were conducted:

- Running tests [5] – 15-m straight run, shuttle run 3×5 m (standing start), 15-m slalom run (first pole at a 5-m distance from the start, the remaining 4 spaced by 1.2 m; standing start), 15-m squat, crouching start; in all the runs time was recorded electronically with 0.01-s accuracy; the results were presented as velocities (15/time);
- Visual co-ordination [6] – upon noticing an asterisk on the monitor, the visualised asterisk’s co-ordinates were to memorise and to enter on the keyboard using a single finger in any sequence. The time of performing the task consisting of 42 events was recorded electronically;
- Handgrip force – with the use of PZA/3359 dynamometer (Fabrication Enterprises Inc., USA) held in the preferred hand, standing position, arms along the trunk: maximum strength, an attempt at applying 50% of maximum strength, and then an attempt at adjusting the force so as to attain the requested 50%. Every variant was repeated 5 times and the respective averages were computed. The results were presented as maximum force (in N) and differences between the 50%-test result and half the actual maximum force; the differences were presented as actual and absolute (to reflect the mean effect and the total error). From the 5 repeated measurements the performance index (PI) [13,14], representing the variability with respect to the maximum value, was computed.

Running velocities were standardised against the respective means and SD’s of Day 1 and mean individual values of 4 runs were computed and presented as Running Performance Index (RPI). The data were subjected to two-way ANOVA (days×subjects) with the post-hoc Scheffé’s test. The level of p≤0.05 was considered significant.

Results

The results are presented in Table 1. Inasmuch the velocity of the straight 15-m run significantly (p<0.05) decreased on Day 3 compared with the two previous days, both co-ordination-related runs were performed better on Days 2 and 3 compared with Day 1. No significant differences were noted in the 15-m squat. When running results were combined into the running performance index, a significantly (p<0.05) better result was attained on Day 2 compared with Day 1. No significant differences were noted for the visual co-ordination test.

No significant differences between consecutive days were found in maximum handgrip force which totalled 632 ± 137 N, individual values ranging from 387 to 927 N. Individual differences between the required force and 50% of maximum force (errors) were not correlated significantly with the respective 50% or corrected values; the between-subject differences were very high as reflected by standard deviations. No significant between-days differences were found for the error 50%, either actual or absolute, which amounted to 12.3 and 13.2% of the respective value of 50% of maximum force. The error of the corrected force was significantly (p<0.05) lowest on Day 1; as to the absolute error value, no significant between-days differences were found and the error averaged 8% of the 50% of maximum force. The values of the performance index (PI) were fairly low which indicated high scatter between repetitions. Lowest error was associated with maximum handgrip force, no significant between-days differences being observed; average PI was equal to 0.888 ± 0.050 and that value was significantly (p<0.001) higher than that for PI for the corrected 50% max force.

Maximum handgrip force correlated negatively and relatively strongly with the running performance index (r = -0.572; p<0.001). The final assessment of subjects did not correlate significantly with RPI (r = -0.166) but the correlation with maximum handgrip force was moderately high (r = 0.484; p<0.01).

Discussion

All participants planned to join defensive formations, like police, army or border guards. Therefore, the results may be considered reliable to illustrate the survival activities of soldiers.
Inasmuch the motor co-ordination indices (MCI) are of great importance when studying military fitness [2], the literature in that area is scarce. In a study on participants of a survival course [10], significant decreases in the heart rate (HR) and in maintaining static balance were found following 36 h of continuous, moderate workloads (including a sleepless night). Decreased HR and vertical jump height were reported following 12 days spent on the training grounds [12]. Shooting, vertical jump height and 1500-m run performances worsened during a two-day march when either caffeine or carbohydrates were ingested, but remained unchanged when both ingredients were administered together [16]. It was also reported [11] that reducing the recommended daily calorie intake by 10% for two days decreased the performance of tasks requiring a marked physical fitness.

Leyk et al. [9] studied the effects of carrying injured subjects on stretchers on hand strength and steadiness. The workout lasted over 3.5 min and resulted in a 3-fold decrease in hand precision (performing injections) and decreased maximum hand strength (by 20%). Hand steadiness recovered fully after 30min while on the following day the hand strength was still decreased by 12%. In this study, no clear-cut effects were observed. Although maximum hand strength seemed to decrease on consecutive days, no significant differences were detected due to very high scatter of results not only between individuals but within subjects as well. The PI values which reflect the scatter of 5 repetitions of every kind of handgrip were very low, i.e. the scatter was high. Again, no significant between-day differences were found except the PI for the requested 50% maximum strength trial on Day 3, when a significant (p<0.05) improvement was noted compared with the previous two days. That task was, on average, the significantly (p<0.05) worst one regarding the reproducibility of 5 handgrips, i.e. the hand steadiness. Yet, drawing conclusions from that fact as to possible shooting accuracy might be premature unless the PI values could prove correlated with hand tremor. That latter phenomenon was reported to affect shooting accuracy in biathletes [8]. This shows that further studies would be desirable to clarify the detailed effects of survival-related fatigue on the performance of tasks requiring high motor co-ordination as an effect of insufficient dedication put in the handgrip performance could not be ruled out.

Those doubts seem to be supported by the results of visual co-ordination tests. Probably, the test structure (42 events taking about 90 s) was not strenuous enough to produce marked fatigue-related differences and designing more specific tests might be advisable.
The results of the battery of running tests applied in this study cannot be compared with other reports since no such data were found in the available literature. Yet, the results are indicative of some decrease of running speed only in the straight sprint; surprisingly, the runs requiring co-ordination (shuttle run slalom) proved significantly better on Days 2 and 3 compared with Day 1 and this was reflected also in the global running performance index. Waśkiewicz [18] reported worsening of several motor co-ordination indices following anaerobic exertions. Maybe, the aerobic, endurance loads are not as deteriorating in that respect and this, again, calls for further studies.

Another interesting finding was the fact that running performance significantly negatively correlated with the hand strength as well as with the final appraisal of the participants. This may suggest that the subjects had either speed or strength skills/preferences and, further, that the performance of strength-related tasks dominated in the overall performance and its assessment. This suggests that all motor skills ought to be shaped, without stressing the preference for strength, as the soldiers ought to be as versatile as possible with respect to their fitness [3].

In conclusion, although the applied tests did no fully reflect the real performance of subjects under the winter survival conditions, it seems that engaging soldiers in consecutive military actions without an adequate recovery should be avoided whenever possible in order to improve the execution of strenuous tasks. On the other hand, the volume of activities like team games and obstacle races should be increased in the routine military training as these help shaping motor co-ordination.

References


