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THE EFFECTS OF ONE-WEEK SKIING CAMP ON WELLNESS, FATIGUE AND BODY COMPOSITION IN RECREATIONAL SKIERS

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Abstract

The purpose of this study was to investigate the effects of one-week skiing camp on wellness, fatigue and body composition in recreational skiers. A total of nine participants were included in this study (Mean±SD; Age: 22.33±0.51 yrs; Body height: 175.56±5.82 cm; Body mass: 74.32±7.04 kg). The experimental programme was performed during skiing camp as part of regular course activities for the student. The following parameters were measured at baseline and after 6 days of skiing at the same time of the day and under similar conditions, including: wellness, fatigue and body composition. Body mass (P=0.002), basal metabolic rate (P=0.001) and muscle mass (P=0.001) were significantly lower after one-week skiing camp. In addition, fatigue, sleep quality and stress level were significantly increased after one-week skiing camp. Major triggers for overtraining syndrome were elevated after one-week skiing camp, therefore overtraining syndrome is expected for longer skiing periods (2-4 weeks) if there is no adequate balance between daily load and recovery.

Key words: skiing, stress, recreational activities, overreaching

Introduction

Recreational skiing is very popular type of physical activity and attracts millions of people every year regardless of age. In recent years, numerous studies have investigated risk factors associated with recreational skiing¹⁻⁴. Most of them are focus on cardiovascular and fracture risks factors while there have been recent researches on helmet use, back protectors or other ski devices as preventive tools^{1,5,6}. Despite there is higher risk compared to other recreational physical activities, recreational skiing could be safe physical activity, even for the elderly, if certain precautions are applied⁶. However, little is known about the effects of recreational skiing on wellness, fatigue and body composition remodelling. Recreational skiing is intermittent type of physical activity with permanent changes of muscle contracts during turns and semi-relaxation periods between turns⁷. Due to numerous of repeated muscle contractions

during typical skiing day, certain level of fatigue is inevitable. However, excess amount of fatigue led to higher risk of injury and reduces the pleasure of the activity⁷. In addition, wellness parameters such as general muscle soreness, stress level, sleep quality and mood could be influenced by higher level of fatigue in recreational skiers.

Seifert *et al.*⁷ has been concluded that acute marker of stress, heart rate and blood lactate correlate to chronic stress and fatigue. However, they monitoring only half day recreational skiing session which is not typical scenario for recreational skiers. Therefore, the effects of one-week skiing camp on fatigue, stress and other wellness parameters remain unclear. Moreover, to the best of our knowledge, no study has focused on the effects of recreational skiing on body composition parameters despite obesity is public health problem worldwide. It remains unanswered is there any chance

to reduce body composition after short term recreational skiing activities due to high amount of energy expenditure during skiing.

Therefore, purpose of this study was to investigate the effects of one-week skiing camp on wellness, fatigue and body composition in recreational skiers.

Methods

Participants

A total of nine participants were included in this study (Mean±SD; Age: 22.33±0.51 yrs; Body height: 175.56±5.82 cm; Body mass: 74.32±7.04 kg). All of them were college students with one-year skiing experience including basic ski course. All the participants were free from any medical conditions and injury based on self-reported data collected through structured interviews. All the participants were informed of the study procedures and provided written informed consent prior to participation. All procedures were approved by an institutional Human Research Ethics Committee.

Procedures

The experimental programme was performed during skiing camp as part of regular course activities for the student. Skiing camp consisted of six full skiing days at altitude between 1100 m to 2017 m. Each skiing day lasted approximately from 9:30 a.m. to 3:00 pm, including a 60 minutes break for lunch and rest. All participants were tested immediately upon arriving at Kopaonik mountain resort (initial measurement) and after six days (final testing). The following parameters were measured at baseline and after 6 days of skiing at the same time of the day and under similar conditions, including: wellness, fatigue and body composition.

Wellness status. Questionnaire was used to assess participants wellness status as previously described by Buchheit *et al.*⁸. Briefly, the questionnaire consisted of five question related to fatigue, sleep quality, general muscle soreness, stress level and mood. Participants scored each question as a five-point scale where 1 means poor while 5 representing excellent wellness rating. Overall wellness status was calculated by summing all particular points.

Body composition. Body composition was measured using bioelectric impedance (Omron BF-511). Participants (wearing minimal clothing) placed their bare feet on the metal plates of the scale and grabbed the hand electrodes as instructed by the manufacturer. The Omron BF-511 automatically measures total body mass, percentage of body fat, muscle mass (kg), and body water in absolute terms to the nearest 0.05 kg and relative terms (%). Body height was measured

using portable stadiometer (Seca 220, Seca Corporation, Hamburg, Germany) with the graduation of 0.1 cm.

Rate of Perceived Exertion (RPE). Participants provided ratings of perceived exertion at initial and final measurements immediately upon arrival⁹. RPE was measured using a 10-point Likert scale, with '1' indicating a minimum response and '10' indicating a maximum response.

Statistical analysis

Data analyses were performed using IBM SPSS Statistics (v19.0; IBM Corp., Armonk, NY, USA). All data are presented as means ± standard deviation (SD). A paired t-test was used to determine differences in wellness, fatigue and body composition parameters between the initial and final measurements during 7-days skiing camp. The statistical significance was set at $p < 0.05$.

Results

A significant decrease was found after one-week skiing camp for body mass ($P=0.002$), basal metabolic rate ($P=0.001$) and muscle mass ($P=0.001$). Non-significant changes ($P > 0.05$) between initial and final measurement were observed for body fat percentage and body water. Fatigue, sleep quality, stress level and RPE were significantly increased after one-week skiing camp (Table 1). In contrast, muscle soreness and mood status were experienced a trivial change ($P > 0.05$).

Table 1. Difference in wellness, fatigue and body composition parameters

	Initial	Final	p-value
Body composition			
Age (yrs)	22.33±0.51	22.33±0.51	---
Body height (cm)	175.56±5.82	175.56±5.82	---
Body mass (kg)	74.32±7.04	72.96±7.03	0.002
Body fat (%)	17.02±3.61	17.04±3.87	0.946
Body water (L)	58.44±2.98	58.07±2.67	0.054
Basal Metabolic Rate	7662.89±509.47	502.67±519.4	0.001
Muscle mass (kg)	58.56±3.71	57.32±3.89	0.001
Wellness and fatigue			
Fatigue	2.89± 0.61	4.01±0.51	0.008
Sleep quality	2.44± 1.01	3.67±1.22	0.038
General muscle soreness	4.01± 0.51	3.89±0.61	0.655
Stress level	4.11± 0.93	4.89±0.33	0.038
Mood	4.44± 0.73	4.99±0.01	0.059
Rate of Perceived Exertion	4.67± 1.87	2.33±1.12	0.034

Discussion

This study aimed to investigate the effect of short-term ski camp (one week) on wellness, fatigue and body composition parameters in recreational skiers. Despite very short period, recreation skiing produces significant changes in body mass and muscle mass. Moreover, this type of recreational physical activity produces higher stress level while sleep quality is decreased. Consequently, fatigue is significantly increased after one-week skiing camp despite lower RPE.

Optimal balance between session load, stress and recovery is necessary for long term recreational activities. Overall wellness status of recreational skiers depends on physiological stress¹⁰, psychological stress and recovery. All aforementioned parameters are associated with fatigue, sleep quality and mood. In this study, stress level is higher after skiing camp compared to baseline because participants have no long experience as skiers (only one year). It is well known that new activities produce higher stress level compared to everyday activities. Therefore, findings in this study are in line with previous which confirmed that the experience of uncommon physical activity unproportionally increase stress level among participants^{11 12}. In addition, prolonged everyday activities on the slopes (more than 270 min), which is not typical for recreational activities, increased fatigue level. In our study, participants performed such amount of increased ski load without adequate recovery seven days in a row, therefore increased fatigue level by 39%, observed in this study, is expected for recreational skiing camp. However, excess activity volume and fatigue are related to sleep quality due to functional overreaching¹³ which is confirmed in this study. Also, altitude exposure is another reason for lower sleep quality and disturbance noted in this study. Based on our findings, there is need to control load and wellness in recreational skiers to avoid serious complications such as overtraining.¹³ listed increased training load without adequate recovery, mood, sleep disturbances and altitude exposure among major potential triggers of overtraining syndrome. All major triggers were elevated during one-week skiing camp in our study therefore overtraining syndrome is expected for longer skiing periods (2-4 weeks) if there is no adequate recovery. One of the most effective and beneficial approaches to counter excess body mass is exercise, which can be administered via different forms of sport, training or exercises. This study showed that recreational skiing is adequate form of exercises to effectively reduce body mass in young recreational skiing. Despite very short activity period (one week), recreational skiing produces very high energy expenditure level which

decreased body mass, body water and muscle mass by 2%, 1% and 2%, respectively. The magnitude of changes observed in this study were similar to typical 12-weeks conventional training programs such as continuous running or high intensity training^{14 15}. Excess amount of daily activities on slopes (more than 270 min) lead to short-term functional overreaching accompanied by large energy expenditure which decrement body mass and muscle mass¹³. Surprisingly, percentage of body fat remained unchanged over one-week camp. Relatively lower body fat percentage (17%) at baseline is reason why short-term skiing activities did not change aforementioned body composition parameter. Previous findings also confirmed that exercises without diet restriction is less effective for fat reduction if participants have low fat values^{16 17}. Unfortunately, present findings can not be compared to other recreational skiing interventions because this is the first study addressed effect of recreational skiing on body composition in young adults.

While the present study offers several beneficial outcomes, some limitations require acknowledgement. First, we performed research on a relatively small sample size. Second, we investigated only young recreational male skiers, therefore future studies should focus on both sexes to understand the specific effects of recreational skiing in both sexes and older age categories. Third, we did not control habitual energy intake and daily intensity during ski camp, which may have influenced the overall results.

In conclusion, one-week recreational skiing camp showed elevation in multiple measures of wellness and fatigue parameters. Stress level and fatigue are higher after skiing camp due to increased load and limited recovery period between skiing days. All aforementioned parameters produce functional overreaching but they have to be under control to avoid overtraining syndrome. Despite elevated stress and fatigue level RPE is lower at the end of camp.

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