

Nutritional behavior while ski-mountaineering: An analysis from the Swiss Alps

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ABSTRACT

The aim of this study was to analyze nutritional habits of well-trained alpinists during a standard ski mountaineering tour. Therefore a sample of eighteen male ski mountaineers (25 ± 5.8 years, 73.2 ± 6.1 kg, 180.2 ± 6.8 cm) were questioned after absolving a typical ski mountaineering tour e.g. Finsterarhorn 4274 meter (Cantone Bern); Gross Ruchen 3183 meter (Cantone Glarus); L'aiguille de la Tsa 3668 meter (Cantone Wallis). It was detected, that nutritional habits differed widely. From bread to meat and chocolate a broad range of nutritionals were consumed. Interestingly, despite the physiological demands special sports nutrition such as gels or special sport bars were not widely used. Lots of alpinists also consumed fruits or dried fruits such as apples or dried apricots. Interestingly, only one person paid special attention to salt intake. Fluid intake seemed with an average of 1.39 ± 0.68 liter per tour relatively low. This was probably also due to the aim of reducing backpack weight allowing to faster reach the peak while increasing security. Due to the low fluid intake Alpinists are encouraged to be well hydrated when starting and to drink sufficiently after finishing tours, especially when tours of several days are absolved a fast rehydration improves recovering and reduces risks of accidents in further tours in the following days. **Keywords:** Alps; Nutrition; Ski mountaineering; Fluid intake.

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INTRODUCTION

Ski Mountaineering is a challenging sport which is characterized by different performance requirements. (Bigard et al. 1996, Tosi et al. 2010, Gutiérrez et al. 1989, Praz et al. 2014, Praz et al. 2015, Burtscher et al. 2008, Burtscher et al. 2001, Cassirame et al. 2014, Duc et al. 2011, Faiss et al. 2014, Mourot et al. 2014, Schenk et al. 2011) During ascent especially cardiovascular system is due to the often several hours lasting smooth pace trained, whereby due to the low intensity fat metabolism is substantially stimulated allowing to reduce cardiovascular risk factors. (Steffny, 2008, Steffny, 2010, Zintl, 1997; Knechtle & Bircher, 2006) During descent on skis special stimulation of eccentric muscle activity with an additional stimulus to musculoskeletal system results. (Hoppeler et al. 1985; Vogt et al. 2003) An additional challenge is the fact, that ski mountaineering is usually practiced in the cold and as a consequence recommendations from other sports such as triathlon cannot be directly adapted. (Pfeiffer et al. 2012) Some special aspects have to be considered when exercising during several hours in the cold on high altitude. (Meyer et al. 2011; Rintamäki et al. 1995) The energetic intake in principle increases in such environments (Tharion et al. 2005). Supporting the complexity, effects from periphery to central (cold face increases blood pressure) were described. (Johnson et al. 2017) Also on energy intake effects of the cold are partly elucidated and it was shown that e.g. after exercising in the cold hunger increased significantly compared to post-exercise hunger in normal temperatures. (Crabtree et al. 2015) Furthermore, in the cold it seems to be an advantage when constantly moving stimulating thermoregulation due to the effect of contracting skeletal muscle producing heat while metabolizing Adenosintriphosphate to Adenosindiphosphate (Zintl, 1997; Steffny, 2008; Steffny, 2010; Hoppeler et al. 1985, Taber et al. 2011) Interestingly, for well-trained athletes it was shown that only moderate effects on metabolism must result when adequate intake of diet is practiced during exercising for a long time in huge cold under challenging conditions (crossing trip of Greenland during 86 days). (Frykman et al. 2003) Although the number of subjects was limited, the observational study demonstrated that well-trained and experienced long-distance ski trekkers who eat an adequate high-calorie diet can perform endurance treks in severe cold, with little or no loss of lean mass and physical capability. (Frykman et al. 2003). The above-mentioned pinpoints some aspects of dietary intake while ski mountaineering and yields to the addressed question of the study. What do alpinists eat and drink on ski-mountaineering tours? Do they pay for example special attention to salt intake? Can parallels be detected to other sports lasting several hours such as triathlon? What do alpinists normally drink and is the fluid intake adequate? As Hypothesis with further falsification it shall be stated that consumed nutritionals and beverages vary broadly among alpinists and nutritional pattern is strongly different from other sports lasting several hours. (Popper, 1969).

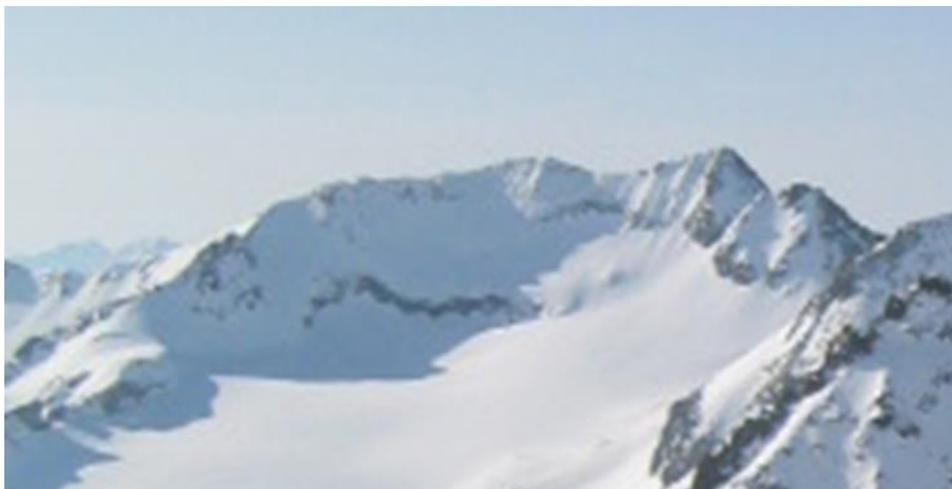


Figure 1. *The Gotthard. A typical region with lots of ski mountaineering possibilities*

METHODS

Participants

18 Male (25 ± 5.8 years, 73.2 ± 6.1 kg, 180.2 ± 6.8 cm) with recreational ski-mountaineering level were questioned concerning their nutritional habits.

Procedures

The administered questionnaire is shown in fig. 1. This semi-quantitative questionnaire was evaluated afterwards and statistically analyzed (Bortz 2005; Stier, 1996). For further calculations concept of performance km was used (Winkler, Brehm &, Haltmeier 2008). Therefore, to compare different tours it is recommended to take 100 meter ascent as well as 200 meters descent and one km horizontal distance as one performance kilometer, whereby in some calculations the 200 meters descent are not count additionally (Winkler et al. 2008).

Statistical Analysis

Descriptive statistics were calculated with mean respectively standard deviation Furthermore, average fluid intake per hour was calculated. Calculations were made with Graphpad Prism (GraphPad Software, Inc., La Jolla, California, USA) and Microsoft Excel (Microsoft Inc., Redmond, Washington, USA).

Nutritional behavior in Ski mountaineering

Age _____

Size _____

Weight _____

Sex _____

What kind of tour did you make? _____

How many meter ascent did you absolve? _____

What do you eat normally on a standard mountaineering tour (1000 to 2000 meters ascent)?

- fruits (apples, pear, orange, kiwi etc.)
- dried fruits
- bread
- meat & sausages
- sandwich
- cake and other bakery products
- chocolate
- bars
- grape sugar

How many portions do you eat during a standard mountaineering tour?

fruits (apples, pear, orange, kiwi etc.)

1 2 3 4 5 6 7 8

dried fruits (Portion 50-150 Gramm)

1 2 3 4 5 6 7 8

bread

1 2 3 4 5 6 7 8

Meat & sausages

1 2 3 4 5 6 7 8

cake and other bakery products

1 2 3 4 5 6 7 8

chocolate
 1 2 3 4 5 6 7 8

bars
 1 2 3 4 5 6 7 8

grape sugar
 1 2 3 4 5 6 7 8

What do you normally drink during a ski mountaineering tour?
 water tea sweeted beverages (Rivella rot, Coca-Cola) artificially sweated beverages(Coca-Cola zero, Orange juice) isotonic beverages (Isostar, Gatorade, Powerrade) Bouillon

How much do you drink normally?
 0-0.5 0.5-1 1.5-2 2-2.5 2.5-3 3-3.5 3.5-4 Mehr als 4 Liter

Do you pay special attention on salt intake?
 yes no

Do you eat special sport food? And if yes, what?
 yes no
 Gels
 Power bars
 other, what _____

Thank you for your time and wonderful tours

Figure 2. The administered questionnaire

RESULTS

Alpinists were ascending typical Ski mountaineering tours in the Swiss Alps such as e.g. Finsterarhorn 4274 meter (Cantone Bern); Gross Ruchen 3183 meter (Cantone Glarus); L'aiguille de la Tsa 3668 meter (Cantone Wallis). An average of 1400 ± 346 Meters ascent yields to a total of more than 20 performance km in average (Winkler et al. 2008). The below Table allows to order in the results first. Only one person paid special attention to salt intake and only two alpinists of the sample took gels or special sport bars. Average fluid intake for a standard ski mountaineering tour was 1.39 ± 0.68 Liter.

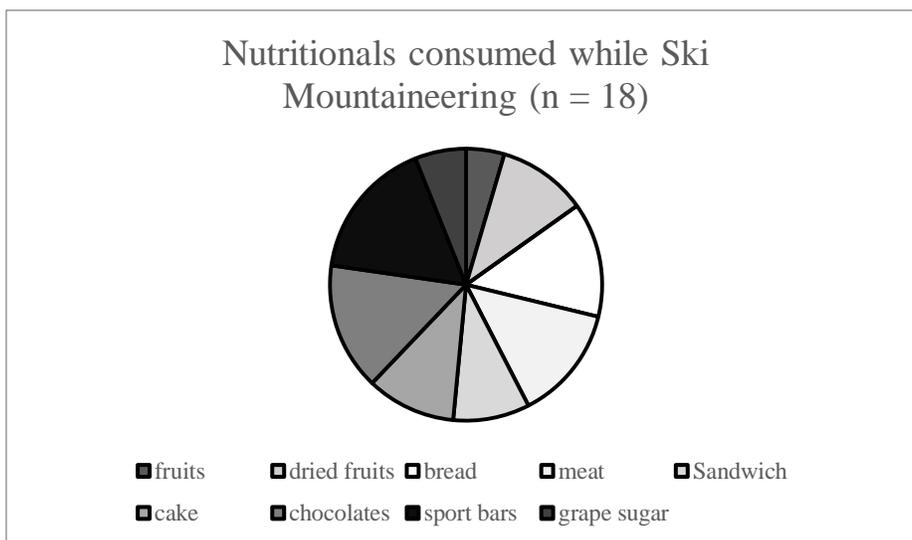


Figure 3. Different nutritionals consumed

DISCUSSION

The aim of the study was to analyze nutritional behavior while ski mountaineering. Based on the detected results the initially stated hypothesis cannot be falsified. Alpinists had a widely different pattern among each other which is also different compared to other endurance sports such as triathlon (Pfeiffer et al. 2012). When further analyzing the semi-quantitative questionnaire in detail a pattern was detected, that some alpinists consumed nearly nothing, while others a lot during tours. Probably these alpinists eat and drink a lot before and after the tours. This impression is also underlined by the fact that the Standard Deviation of fluid intake is relatively large. Furthermore, fluid intake seemed with an average of 1.39 ± 0.68 liter relatively low, when keeping in mind that some alpinists absolved large tours such as Finsterarhorn (4274 meter). This was probably also due to the aim of reducing backpack weight allowing to faster reach the peak while increasing security (Munter, 2017; Winkler et al. 2008; Fernández-Castro et al. 2008). Concerning the different nutritionals it is to mention that about half of the sample consumed fruits or dried fruits. Besides other positive aspects on health e.g. apples are well suited and do not getting muddy when carried in a backpack (Hoffmann et al. 2008, Davis et al. 2015; Kopac et al. 2011; Martin et al. 2007; Zhao et al. 2012) Furthermore, it is getting obvious, that lots of alpinist probably took enough salt from eating meat during tours and there seem to be hardly deficits implying some irrelevance to pay special attention to salt intake. Interestingly, only one person mentioned to pay special attention to salt intake. Besides that, often in SAC-Cottages a sufficient salty meal is cooked, does not making it necessary to take additional salt. To keep in mind, salt intake increases blood pressure and therefore headache or even high altitude cerebral edema or high altitude pulmonary edema can be provoked. To sum up, optimal nutrition while ultra-exercising results in a decreased risk of energy depletion, better performance, and quicker full-recovery while increasing security for further tours in the next days (Williamson 2016, Munter, 2017; Winkler et al. 2008).

PRACTICAL IMPLICATIONS

Nutritional habits in (ski)-mountaineering differed widely among alpinists, whereby a relatively low intake of fluid was detected, probably due to reducing backpack weight while increasing performance possibilities and security.

This did not seem to hamper performance; however alpinists should be aware of the fact and drink enough after a tour.

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