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Short versus Long Course at Patrouille Des Glaciers (Pdg)–Who Participates At the Original Course from Zermatt to Arolla and Verbier

Benedikt Gasser*

Swiss Health and Performance Lab Institute of Anatomy, University Of Bern Baltzerstrasse 2, Ch-3000 Bern, Switzerland

***Corresponding author:** Benedikt Gasser, Swiss Health and Performance Lab Institute of Anatomy, University Of Bern Baltzerstrasse 2, Ch-3000 Bern, Switzerland, Tel: +41 31 631 84 68; E-mail: Benedikt.gasser@yahoo.com

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Abstract

Background: The biggest ski mountaineering race of the West Alps Patrouille des Glaciers (PdG) is characterized by a short course from Arolla-Verbier and a classic distance from Zermatt-Arolla-Verbier. In accordance with general findings from endurance sports e.g. running where the average speed in half marathon is lower compared to marathon these findings should also be valide for PdG. This yields to the aim of the study to analyze potential differences between the short versus the long course at PdG.

Material and Methods: All participants of PdG 2018 were analyzed yielding to a total of 207 Patrols (principally three alpinists) from race one from Zermatt-Arolla-Verbier, 344 patrols from race two Zermatt-Arolla-Verbier as well as 374 patrols from race one of the short distance Arolla-Verbier and 375 of race two Arolla-Verbier with an average age in female of 39.1 ± 10.2 years and male 41.4 ± 10.9. Average speed was calculated with the concept of performance km for the different parts of the short and the long race. Furthermore, significance of differences between average speed of the short and the long race was analyzed with two-sided t-tests.

Results: In total, average speed was significantly higher in the original race compared to the short course. Only the first part just after the start was faster in the short race Arolla-Verbier compared to the original race Zermatt-Arolla-Verbier.

Discussion: These findings are somehow contra intuitive but might be explained by the different samples of participants at the short versus the long race. At the long race mainly highly trained alpinists take part whereas the short races more often attracts recreational alpinists. Beside that gender differences are to mention: Only thirteen female participants absolved the original course (less than 0.01 percent) whereas in the Arolla-Verbier nearly one fourth were female (0.24 percent) implying the large physical challenge in the original course mainly absolved by men.

Keywords: Sports physiotherapist; Injuries; Diagnostic imaging

Introduction

Mountaineering and especially ski-mountaineering competitions have gained increased attention in the last years [1-3]. The demand to participate at the biggest Ski-mountaineering race of the alps Patrouille des Glaciers (PdG) is still increasing. PdG is characterized by a short course from Arolla to Verbier and a classical race from Zermatt-Arolla-Verbier. Both courses are signed by special challenges. In the long course a main challenge is the long distance from more than 4000 Meters ascent and 50 km distance. In the long course even well-trained patrols need around 12 hours in order to sucessfully complete the race, wehereas in the short course with a distance of 26 km and around 2000 Meters ascent around 6 hours are necessary. In the short course it is necessary to be fast in changes (pulling off skins after an ascent) in order to be under the top patrols, in the long course especially the long distance and the amount of ascent becomes a special challenge. Both courses have to be taxed as large challenges from a physical and a psychical point of view. The original course is comparable to a typical ultraendurance competition, making it necessary to absolve a large share of the race in fat metabolism [4-8]. Downhill skinig is an additional challenge due to the usage of eccentric muscle work with a potential development of a delayed onset of muscle soreness [9,10]. To keep in mind, most parts of the race are absolved above 2000 meters altitutde making the lower oxygen partial pressure an additional challenge [11,12]. In addition, the weather (especially wind and snow fall) and the snow conditions on the track are depending on conditions an additional challenge [13-15]. Nutritional intkake with fluid and water managment becomes curcial and it is important not to start too fast in order to suceessfully complete the race [4-8]. From a biological point of view alpinists absolving the short

race should have faster average course times than alpinists starting at the long course. Analogies can be taken from running respectively the decrease of average speed due to distance as a consequence of metabolic restrictions [4-6]. For example a runner with a 10 km besttime of 40 minutes should have the ability to run a Marathon in 3 h 6 Minutes yielding to around 4 minutes 25 sec per km (around 10 percent slower) [4]. Trying to explorate a 100 km Ultracourse the formula 100 km time=marathon time x 3 can be used (if marathon time is belwo 3 hours the minutes below can be counted down from 100km time) yielding to around 5 min 35 per km and around 25 percent slower than the average speed in marathon running. (Steffny, 2008) The question arises: how is the relationship between the short and the long course at PdG? As hypothesis with potential falsification it shall be postulated, that average speed of the absolved parts does not differ between the short and the long course. (Popper, 1969)

Figure 1 The nice scenery at PdG at Schönbiel in the beginning of the race of the original course.

Methodology

Participants

A total of 207 Patrols (three alpinists) from race one from Zermatt-Arolla-Verbier, 344 patrols from race two from Zermatt-Arolla-Verbier as well as 374 patrols from race one of the short distance from Arolla-Verbier and 375 from race two Arolla-Verbier with an average age in female of 39.1 ± 10.2 years and male 41.4 ± 10.9 years were analyzed concerning steadiness of absolving PdG original course from Zermatt to Arolla and Verbier (53 km horizontal distance/3994 meter ascent/4090 meter descent) or the short course from Arolla to Verbier (26 km horizontal distance/1914 meter ascent/2374 meter descent).

Measurement procedures

Several concepts exist to quantify performance of hiking and mountaineering [16-20]. The most often used for mountaineering in the Alps is the performance km concept [14,15]. This concept implies that one km of horizontal distance as well as 100 meter ascent or 200 meters descent are one performance correlate–a performance km. Separated in the different parts of the race for the long distance (original course) Schönbiel-Tête Blanche/Tête Blanche-Col de Bertol/Col de Bertol-Plans de Bertol/Plans de Bertol-Arolla/Arolla-Col de Riedmatten/Col de Riedmatten-Pas du Chat/Pas du Chat-Rosablanche/Rosablanche-Col de la Chaux/Col de la Chaux-Les Ruinettes/Les Ruinettes–Verbier differences in average speed were analyzed.

Statistical Analysis

All parts of the classic distance as well as the short race were quantified with the performance km concept and mean and standard deviation of all parts were calculated. In order to decipher differences of short versus long course two-sided heteroscedastic t-tests were performed [21]. Analyses were conducted with Graphpad Prism (GraphPad Software, Inc., La Jolla, California, USA) and Microsoft Excel (Microsoft Inc., Redmond, Washington, USA).

Results

In order to analyze differences in average speed for different parts of the race average performance km was calculated **(Table 1).** Interestingly, the average speed per performance km was with 6.5 ± 0.7 minutes in the original race faster than in the short race with 7.5 ± 1.6 minutes despite a total higher work load in the original race ($p<0.001$).

Table 1 The average performance km in minutes for the original course from Zermatt-Arolla-Verbier (n=561) as well as for the short distance Arolla-Verbier (n=944).

	horicontal distance	Ascent	Descent	Performance km	Mean	SD	Mean	SD	T.Test
Zermatt-Süd Schönbiel	8	1078		18,80					
Süd-Schönbiel-Tete Blanche	8	956		17,60					
Tete Blanche-Col de Bertol	4	50	371	6,40					
Col de Bertol-Plans de Bertol	3		615	6,10					
Plans de Bertol-Arolla	5		678	8,40					

Arolla-Col de Riedmatten	5	933		14,30	6,80	0,70	5,10	0,70	0,001
Col de Riedmatten-Pas du Chat	2		338	3,70	9,60	2,00	11,80	2,90	0,001
Pas du chat-La Barma	3	50	123	4,10	18,20	2,90	20,90	5,40	0,001
la Barma-Rosablanche	5	702		12,00	8,20	1,20	9,20	2,00	0,001
Rosablanche-Col de la chaux	4		220	5,10	9,00	1,30	10,50	2,60	0,001
Col de la chaux-les Ruinettes	4	170	745	9,40	1,90	0,60	2,20	0,70	0,001
Les Ruinettes-Verbier	2		643	5,20	2,90	0,60	3,10	1,00	0,001
Total	53/26	3994/1914	4090/2374	111.1	6,50	0,70	7,50	1,60	0,001

Discussion

The aim of this study was to analyze differences in average speed between the short course from Arolla to Verbier and the orginal course from Zermatt-Arolla-Verbier of PdG. The first course from Arolla to Col du Riedmatten was the only part in average absolved faster by the alpinists participating in the short race. This might be due to the general fact that often in endurance sports in the beginning the speed is too high while continuously decreasing over the course [4-5]. A simple explanation for this finding might be that participants of the short course were fresh and motivated starting with a too high speed in the beginning. Furthermore, due to the fact that organizations divided the two samples in Arolla the courses were a little bit different making the comparison vague. From the second part of the race average speed in the short course was constantly slower than in the long course, whereby these differences where highly significant for all parts. ($p<0.01$) To keep in mind, these were not intraindividual comparisons making for example an association of marathon versus 100 km races (speed is around one fourth slower in 100 km races) vague and in consequence reasons for the detected differences must be found in other factors. First hints can be derived from sample differences. A lower share of female took part in the original race. In the start field 1 from original course less than one percent (only 13 female participants) was female and in the start field two no female patrol took part. In the short course in the first race from Arolla-Verbier 0.162 percent were female and in the second 0.251 percent. In total a share of 0.16 percent was female however when separated due to course in the short race the share was with an average of 0.24 clearly higher compared to the original race with 0.0081 percent. Biological restrictions become evident: men have in average 30 percent more muscle force compared to women [5,6]. The share of skeletal muscle is with 40-45 percent higher in men compared to women with 25-30 percent. Influences of steroid hormones especially estrogens yield in women to a higher share of fat and water compared to men with a lower lean mass. As rule of thumb in women the share of active body mass (muscle and inner organs) is around 8 percent lower compared to men. This is a result of evolution with biological reserves especially for gestation in line with the great statement of Dobazionous Theodazski: 'Nothing in biology makes sense except in the light of evolution [22]. Even well trained female athletes have with a share of 20-25 percent body fat compared to men with 12-17 percent a higher share of body fat. These biological restrictions of female alpinists yield to a decrease in average performance capacity of 10-15 percent. The above mentioned might yield to the fact that women more often choose the shorter race from Arolla-Verbier yielding to a higher average speed in the different parts due to biological performance restrictions [23-27].

To summarize, the shorter course is more often absolved by women and probably recreational sportsmen in contrast to the long original course which is mainly absolved by experienced alpinists. Besides these interindividuell analyses intraindividuel analyses might yield to further hints concerning the performance restrictions of short and long distances in ski-mountaineering races.

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