
The Faster, the Better the Self-estimation? An Analysis from Patrouille Des Glaciers (PdG)

Running Head: Patrouille des Glaciers – estimation course time

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Abstract

The ability of estimation of situations has for safety reasons high relevance in mountaineering, whereby it is suggested, that alpine skills correlate with the ability of self-estimation. This yields to the aim of the study to elucidate the relationship between self-estimation and course time for the largest ski mountaineering race of the West Alps Patrouille des Glaciers (PdG). Therefore, 551 patrols of the original race from Zermatt-Arolla-Verbier and 749 of the Arolla-Verbier race in 2018 were analyzed concerning the relationship between estimated course time and effective course time. In average, the participants overestimated the effective course time about half an hour yielding to an underestimation of own's ski mountaineering capabilities. Furthermore, it was identified, that the better the performance of a patrol, the more likely an underestimation of own capabilities was detected. In addition, relatively clear indications were found that with increasing performance levels a better ability to assess ski mountaineering performance exists.

Keywords: PDG, course time, estimation, Zermatt, Arolla, Verbier

Introduction

Mountaineering and Backcountry skiing has gained increased popularity and in consequence also different competitions especially Patrouille des Glaciers (PdG) gained more and more attraction (Burtscher, Faulhaber, Kornexl & Nachbauer, 2005; Burtscher et al. 2001; Faulhaber, Flatz & Burtscher, 2007; Reglement PdG, 2018; SAC-CAS, 2016). The original course of PdG has not changed substantially and starts in Zermatt, yields via Schönbiel - Tête Blanche - Col de Bertol - Plans de Bertol to Arolla. From Arolla up to Col de Riedmatten – La Barma - Pas du Chat - Rosablanche - Col de la Chaux - Les Ruinettes to Verbier (Reglement PdG, 2018; SAC-CAS, 2016). The short race encompasses the second part from Arolla to Verbier. The increased demand for participation has yield to two start fields (Reglement PdG, 2018; SAC-CAS, 2016). The original race encompasses 53 km length, +3994 m ascent, -4090 m descent resulting in 110 performance km (Reglement PdG, 2018; SAC-CAS, 2016; Winkler, Brehm & Haltmeier, 2008a; Winkler, Brehm & Haltmeier, 2008b). The course Arolla – Verbier encompasses a length of 26 km and +1914 m ascent, -2374 m descent resulting in 53 performance km (Reglement PdG, 2018; SAC-CAS, 2016; Winkler, Brehm & Haltmeier, 2008a; Winkler, Brehm & Haltmeier,

2008b). The performance requirements have to be taxed as endurance sports, whereby upper and lower extremity are used as well as cardiovascular system (Hatzl & Burtscher, 1999; Schwameder, 2004; Schwameder, Schilcher, Ring, 2005; Zintl & Eisenhut, 2009). The ascent with moderate steepness is an alternating gliding movement forward, in steeper ascents normally switchbacks are made and in passages with more than 45 degree it is recommended to carry the skies (Munter, 1997). Thereby hints exist that a gliding movement not too fast is more energy efficient compared to fast steps forward (Duc, Cassirame, & Durand, 2011; Praz, Léger, & Kayser, 2014; Tosi, Leonardi, Zerbin, Rosponi, Schena 2010). The downhill is especially with short swings signed by a high share of eccentric muscle work (Hoppeler & Vogt, 2014; Vogt, Däpp, Blatter, Weisskopf, Suter & Hoppeler, 2003). Besides the physical dimensions of ski-mountaineering the technical and tactical dimension is to mention entailing the important capability to rate technical conditions with objective dangers (avalanche risks, rock falls, rapid weather changes etc.) and subjective dangers (group dynamic, overestimation of own abilities, fatigue etc.)(Berghold et al. 2015; Winkler, Brehm & Haltmeier, 2008a; Winkler, Brehm & Haltmeier, 2008b). Good risk management entails the ability to rate dangers adequately, whereby often a divergence between self-estimation and alpine skills can be detected, were by these relationships are not finally elucidated (Berghold et al. 2015). Winkler, Brehm & Haltmeier, 2008a; Winkler, Brehm & Haltmeier, 2008b). This might result beside other reasons from the difficulty of operationalizing constructs with the difficulty of adequate measurements. A first approach could be to analyze the relationship between effective and expected course time at PdG.

It is likely to suggest that better alpinists (as approximation for the level the effective course time can be chosen) absolve PdG faster. Furthermore, it is to assume that better alpinists have better abilities to estimate the time needed to absolve PdG. This is likely to suggest that for example due to a larger repertoire of absolved ski-mountaineering tours experience is larger allowing making more valid estimations concerning conditions. This yields to the question of the study: Is there a relationship between ability for self-estimation and performance level yielding to the following hypothesis: (i) there is no relationship between effective and estimated course time (ii) Performance capacity has no effect on self-estimation capabilities (Popper, 1969).

Material & Methods

Participants

It was tried to analyze all participants of the races of Patrouille des Glaciers in 2018. The participants absolved the course normally in teams of three (so-called patrols) due to security reasons such as rope handling on glaciers. When a participant was excluded it was possible to finish in pairs. In total 207 patrols of the first start field Zermatt-Arolla-Verbier, 344 patrols of the second start field of original race, as well as 374 patrols of the short race from Arolla-Verbier and 375 from the second start field Arolla-Verbier, were analyzed. Patrols arriving in Verbier in pairs were also included in analysis if one alpinist had to stop due to for example exhaustion, technical problems or for medical reasons. A resulting dataset of 1300 patrols (3 alpinists at start)

having in female patrols an average age of $M(SD) = 39.1 \pm 10.2$ years and in male an average age of $M(SD) 41.4 \pm 10.9$ years.

Procedures

Each patrol had during the enrollment around 6 months before the race to name the expected course time. Races were between 17. 04. 2018 - 22.04.2018, whereby it was started in different start fields. The two first fields started in the beginning of the week and the second start fields around 48-72 hours later. Due to the fact that different conditions were present in the two start fields such as weather and snow conditions (especially avalanches) analyses were conducted separately per start field (Winkler, Brehm & Haltmeier, 2008a; Winkler, Brehm & Haltmeier, 2008b; Munter, 1997; Harvey, Rhyner, & Ammann, 2002). This yielded in total to four start fields two from the original race from Zermatt-Arolla-Verbier and two from Arolla-Verbier. Data were received in anonymous forms by organizations via www.raceresults.com/de-ch.

Statistical Analysis

In order to analyze the relationship between effective and estimated course time analyses were conducted per start field. In a first step error of estimation was calculated as difference between effective and estimated time and analyzed descriptively. This was followed by Shapiro-Wilks Test on normal distribution. The later conducted tests conditioned freedom of distribution. When comparing times between start fields (effective time start field one versus effective time start field two respectively estimated time start field one versus estimated time start field two) in consequence Mann-Whitney U-Tests were calculated. For analyzes within a start field (difference effective versus estimated course time) Wilcox on tests were calculated. Furthermore, correlation analysis with Spearman’s rank order-correlation were conducted between estimated and effective course time as well as effective times and the estimation errors (Stier, 1996). Analyzes were conducted with Microsoft Excel and SPSS (Microsoft Inc., Redmond, Washington, USA).

Results

Tab. 1 shows the descriptive analysis (Tab. 1). To sum up, there seems to be for start field 1 of original race an underestimation of own physical capabilities $M (SD) = -24.8 (108)$ Minutes. This pattern can also be detected in start field two of original race, in which $M (SD) = -28.7 (108.7)$ Minutes can be detected. For start field 1 of short race resulted an underestimation of own physical capabilities of $M (SD) = -26.3 (99.3)$ Minutes, whereby this pattern can also be detected in short race with $M (SD) = -42.4 (91.3)$ Minutes. Over the whole sample an average underestimation of course times of $M (SD) = -31.3 (101.2)$ Minutes was detected.

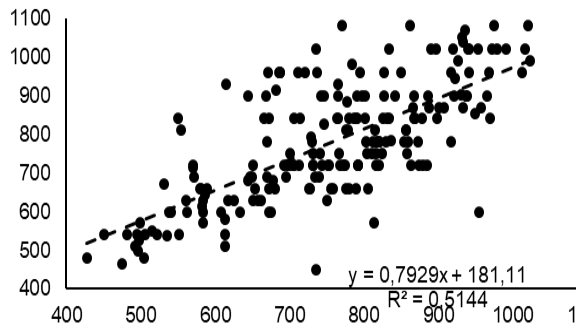
measurements in minutes	descriptive statistik	n	minimum	maximum	median	mean	sd
start field 1 original race	effective time	207	427.2	1023.2	766.7	754.8	135.4
	estimated time	207	450.0	1080.0	780.0	779.6	149.7
	difference	207	-315.5	354.1	-14.8	-24.8	108.0
start field 1 original race	effective time	345	335.5	1024.6	712.0	698.6	157.8
	estimated time	344	360.0	1200.0	720.0	727.9	197.1

	difference	344	-379.3	423.0	8.2	-28.7	108.7
start field 1 short race	effective time	376	164.5	658.9	386.9	392.6	82.9
	estimated time	376	180.0	780.0	430.0	435.0	98.5
	difference	375	-432.4	205.9	-34.6	-42.4	91.3
start field 2 short race	effective time	374	220.2	692.5	445.0	418.7	86.6
	estimated time	374	240.0	930.0	417.4	444.9	97.5
	difference	374	-565.7	218.2	-14.4	-26.3	99.3

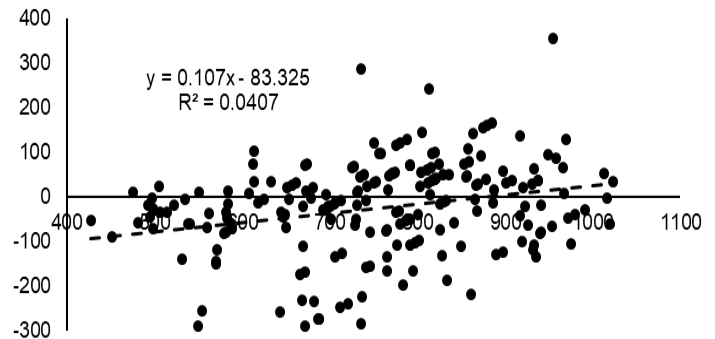
Tab. 1: Descriptive analysis of estimated and effective course times separated according to start field. A negative error implies an underestimation of own abilities.

Zermatt - Arolla - Verbier

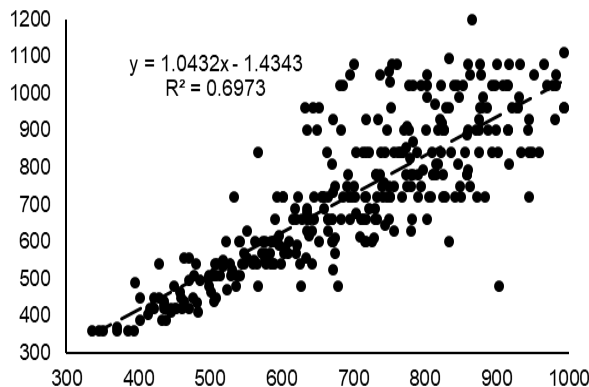
field 1 (a) effective vs estimated course time



(b) effective vs estimation error



field 2 (a) effective vs estimated course time



(b) effective vs estimation error

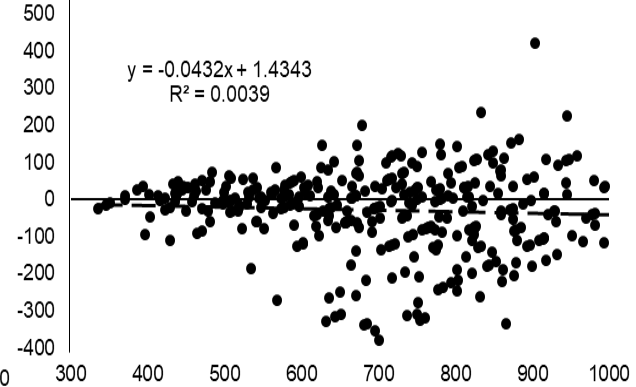


Fig. 1: Original race – Zermatt-Arolla-Verbier (a): the relationship between effective course time (x-axis) and estimated course time (y-axis) (b) estimation error respectively difference between effective course time and estimated course time on y-axis, negative values are signed by

an underestimation of own performance capacity. x-Axis entails effective course times; y-axis entails estimation error.

Arolla - Verbier

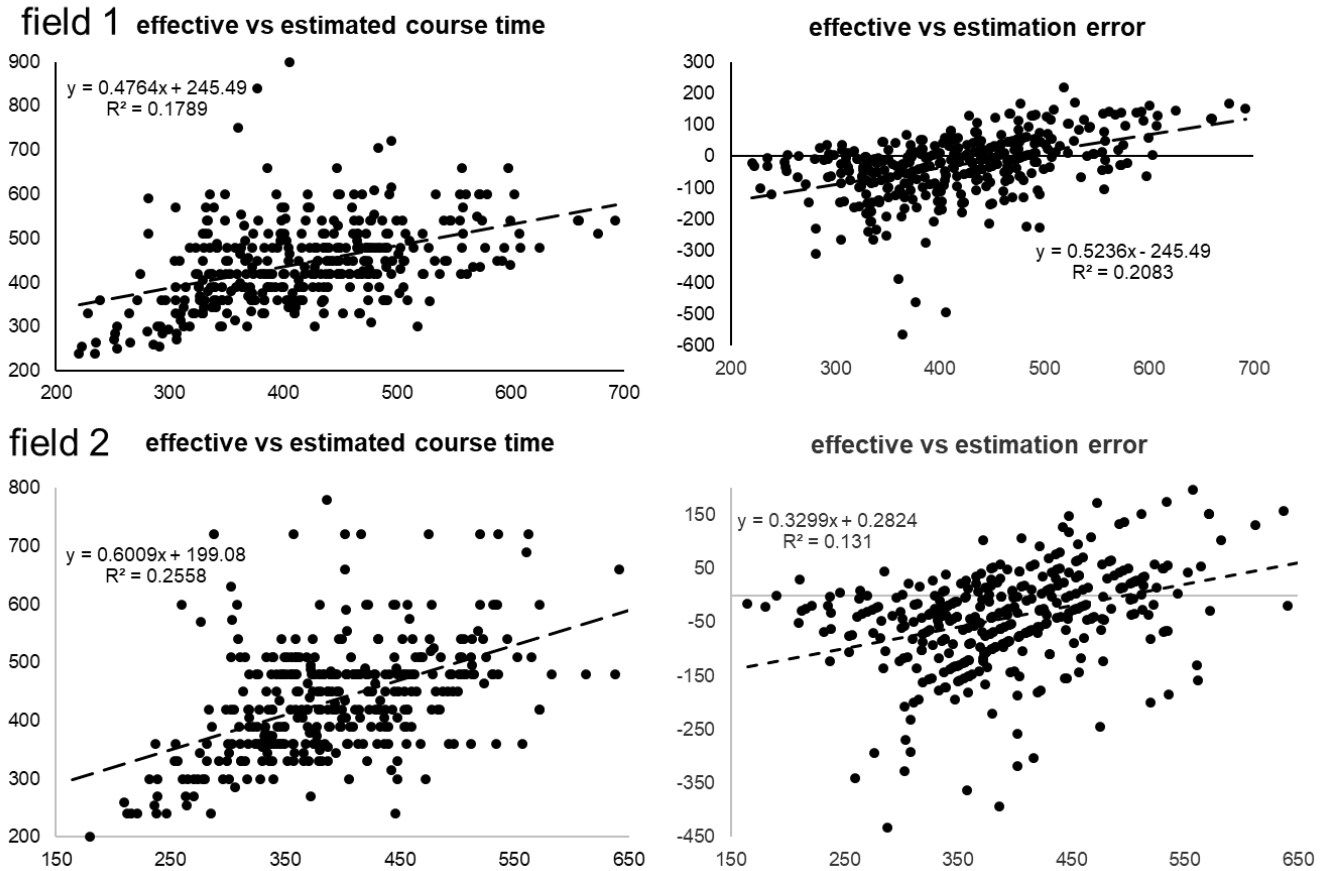


Fig. 2: short race Arolla - Verbier (a): the relationship between effective course time (x-axis) and estimated course time (y-axis) (b) estimation error respectively difference between effective course time and estimated course time on y-axis, negative values are signed by an underestimation of own performance capacity. x-axis entails effective course times; y-axis entails estimation error.

Due to no normal distribution in all sub variables (Shapiro-Wilk Tests $p < .05$) except effective time on short race start field 2 further analyses had to be conducted distribution free. Differences between start fields (start field 1 versus start field 2 – effective course time start field one versus effective course time start field two respectively estimated course time start field one versus estimated course time start field two) were analyzed with Mann-Whitney U-Tests. Within a start field (difference effective versus estimated course time) Wilcoxon tests were conducted. The

effective versus estimated course time in start field one on the original course was significantly different ($p = 0.007$), the effective versus estimated course time on the original course was highly significant different ($p < 0.001$), whereby in addition highly significant differences could be detected for start field one and two on the short course ($p < 0.001$).

Furthermore, correlation analysis between effective and estimated course time were calculated (Spearman's rank order-correlation). Correlation coefficients were 0.691 (effective versus estimated) for start field one of the original races, 0.839 for start field two of the original race, 0.455 start field one of the short courses, 0.483 for start field two of the short race, whereby all correlations were significantly different ($p < 0.01$).

In addition, correlations were calculated between effective course time and estimation error (difference effective and estimated course time) calculated. These were 0.283 (effective versus estimation error) for start field one of the original race, -0.078 (effective versus estimated) for start field two of the original race, 0.488 (effective versus estimation error) start field one of the short course, 0.374 (effective versus estimated) for start field two of the short race, whereby all correlations were significant ($p < 0.01$).

Discussion

The aim of this study was to analyze if there is a relationship between the ability of self-estimation and the course time at the largest ski-mountaineering event in the West-Alps Patrouille des Glaciers. Hypothesis (i), that there is no relationship between effective and estimated course time at PdG seems to be rejectable. In addition, hypothesis (ii), that the performance level has no influence on self-rating abilities, seems to be in addition reject able due to positive correlations between effective course time and estimation errors with the exception of start field two of the original race. Due to distribution characteristics of data it is to mention that most patrols only made an estimation error of around a quarter hour or less (Medians of estimation errors in start field one and two of original race and short race start field two), which is probably only the logical and wanted consequence of a quarter hour security margin. Thereby it is to keep in mind that in the analyzed year snow as well as temperature conditions were optimal, which was not known at the time of enrolment and probably accounts further for the underestimating tendency. The better estimation behavior in faster patrols is probably also due to the larger experience in the mountains. Alpinists with repeated activity have more often reflected their abilities in the mountains (Winkler, Brehm & Haltmeier, 2008a; Winkler, Brehm & Haltmeier, 2008b; Munter, 1997). Trying to combine with current evidence mountain specific investigations are missed. One approach might be the metanalysis by Zell & Krizan (2014), estimating from 22 primary studies with more than 200'000 participants aggregated correlations between self-estimation and performance, whereby for different life areas overall a relationship of 0.29 ± 0.11 was reached with a range of single analysis between 0.09 to 0.63 (Zell & Krizan, 2014). In first approximation there seem to be no reasons, why these results do not count for mountaineers respectively participants at PdG (Munter, 1997; Berghold et al. 2015). However, the relatively low relationships were not replicated by the conducted analysis and in consequence higher values result from correlative analysis. This is probably due to the study design and the used construct of self-estimation, which only uses a one factor approach in the way of expected

course time. In order to come back to the analysis interestingly higher coefficients of determination can be found for the original races compared to the short races (Fig. 1, Fig. 2). This might be due to the fact that for the longer course more experienced alpinists participate with several years of mountaineering experience, in contrast to the short race with more recreational alpinists. To sum up, for the competition based and only partly correlating analysis situation with mountaineering reality without avalanche security measures, course controls or marked routes, it can be deciphered, that with increasing performance level a better estimation of own alpinist capabilities result. This would be in line with the important aspect of relevance of experience in mountains correlating with the performance level. The findings were suggested due to hints from endurance sports: It is to expect that performance level correlates with the capabilities to estimate its performance during endurance competitions such as marathon running (Steffny, 2008; Zintl & Eisenhut, 2009). Results are limited by some factors. First, course time was used as indicator of experience. However, this interacts with other factors. Second, participants absolving PdG several times can probably better estimate the expected course time, which could not be considered in these analyses. Third, estimated course times can underly different conscious and unconscious distortions such as classical '*understatement*', not willing to communicate ambitions due to competition-based reasons. Despite all that it seems to be valid, good training state – better estimation.

Practical Implications

For participants at PdG, it was revealed that less-trained ski mountaineers in tendency overestimate their abilities. This is a well-known fact that less competent humans tend to overestimate their abilities compared to better trained (Kruger & Dunning, 1999). Therefore, through regular ski-mountaineering in advance of large races such as PdG the capabilities to estimate situations can be improved. Therefore, it is recommended to start early in advance in order to improve these abilities allowing to participate successfully at PdG.

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