Assessing heterogeneity (and predictability ??) of runners' performance in Switzerland

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ABSTRACT

keywords: Aging, Distance running, Endurance performance, Sex difference

Introduction

as show in[1] blabalblab

Results

Demographics

In fig. 1(a) and 1(b) we show respectively how number of runners increased in the last 15 years, by distances and gender. This raise was faster for man then for women, and faster in the shorter distances (10 Km) than for longer one (participants in full marathons, 42 Km, seems to have decreased) [1].

The case of Lausanne Marathon

Overall performance analysis

Age-performance relation

remember to cite the relevant papers[2][1][3][4]

Temperature-performance relation

we don't have enough data (can be re-checked)...

some reviews on the topic:
http://runningstrong.com/temperature.html
http://believeperform.com/performance/the-effects-of-heat-on-sport-performance/

Geographical analysis

(to be included ??) (by antonio)

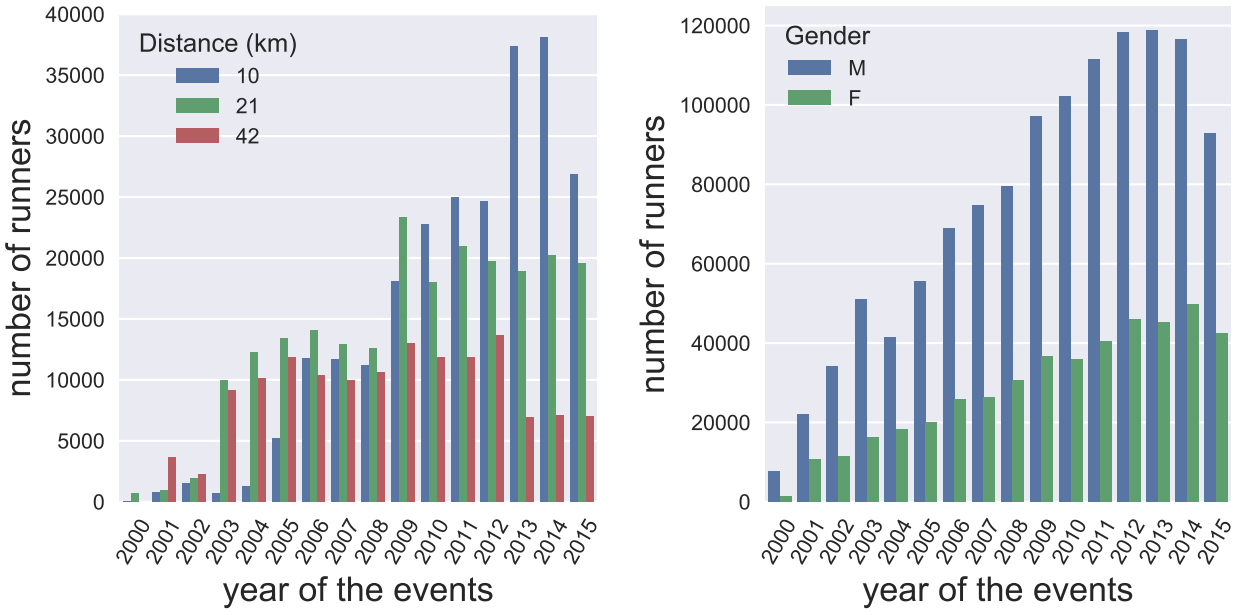
Network of runners

(to be included ??) (by Gr)

Forecast of career advancement (??)

(not done yet)
nice article on fivethertyeight, pointing to one of the best/latest model[5]

[1]For simplicity we only include th e most popular distances. There are many events that include shorter distances, like 3 Km, 5 Km, usually attended by few young runners.



(a) (b)

Figure 1. Number of participants in running competition in Switzerland, across time, by distance and gender.

Discussion

Methods

Data parsing

@stefano

Data analysis

All analysis were performed on python notebooks (available on the related repository), using standard python packages for data analysis and plotting, such as `pandas`, `seaborn`, `scipy`, `powerlaw`[2] and `networkx`.

Data visualization

We implemented interactive visualizations of some of our results and collected them in the Hop Suisse[3] website. After exporting the data needed for the plot in `.json` dumps, we used C3.js for the interactive plotting. More details on how datasets queries and plots were built can be found on the dedicated GitHub repository[4]. We also build an animated infographics[5], inspired by Hans Rosling's work. With such video we wanted to show in a more powerful and clear way the relations among runners' mean pace, experience and age, providing as well information on gender and race length (the python code used to construct the video frames can be found in the related folder[6] of our GitHub repository).

References

1. Connick, M. J., Beckman, E. M. & Tweedy, S. M. Relative age affects marathon performance in male and female athletes. *J. sports science & medicine* **14**, 669 (2015).
2. Knechtle, B., Assadi, H., Lepers, R., Rosemann, T. & Rüst, C. A. Relationship between age and elite marathon race time in world single age records from 5 to 93 years. *BMC sports science, medicine rehabilitation* **6**, 31 (2014).

[2] https://pypi.python.org/pypi/powerlaw
[3] https://hopsuisse.github.io
[4] https://github.com/hopsuisse/hopsuisse.github.io
[5] https://www.youtube.com/watch?v=MyvbnOXHShw
[6] https://github.com/ggrrll/hop_suisse_ada_project_public/tree/master/8-video

3. Lara, B., Salinero, J. J. & Del Coso, J. The relationship between age and running time in elite marathoners is u-shaped. *Age* **36**, 1003–1008 (2014).

4. Lehto, N. Effects of age on marathon finishing time among male amateur runners in stockholm marathon 1979–2014. *J. Sport Heal. Sci.* **5**, 349–354 (2016).

5. Vickers, A. J. & Vertosick, E. A. An empirical study of race times in recreational endurance runners. *BMC Sports Sci. Medicine Rehabil.* **8**, 26 (2016).

Author contributions statement

G.L. and A.I. performed the data analysis. S.S., O.C. and M.P. performed the data parsing. G.L. and S.S. wrote the manuscript. M.C. and M.S. review the manuscript.

Additional information

All the code used to parse the data from https://www.datasport.com/en/, for data analysis and visualization can be found in our open GitHub repository: https://github.com/ggrrll/hop_suisse_ada_project_public.

Competing financial interests

The authors declare no conflict of interests.