

What are the main risk factors for lower-extremity running-related injuries? A retrospective survey-based on 3669 respondents

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Background:

Endurance running efficiently provides substantial beneficial effects on body mass, body fat, resting heart rate, maximum amount of oxygen (VO₂max), triglycerides and high-density lipoprotein (HDL) cholesterol. It has also been shown that the longer the length of training, the higher the achieved health benefits. Unfortunately, endurance running is also associated with a high rate of injuries, and especially lower extremities injuries. A large recent systematic review highlighted an overall injury prevalence in runners of 43% (Standard Deviation= 19.8). The large variability observed in these results may be explained by differences in the characteristics of the target populations investigated and in the definition of running-related injury (RRI) used across studies. Multiple authors have tried to identify the aetiology of RRI and risk factors to reduce the injury rate. Risk factors are usually classified into two categories: intrinsic (i.e. anatomical, biomechanical and global health) and extrinsic factors (i.e. training characteristic). Most studies suggest that previous injuries are the most well established RRI risk factor. Despite a lot of studies having been conducted on running injuries, other risk factors are still not clear in the literature.

Objective:

The goal of our study was therefore to investigate the risk factors associated with injury amongst a large and heterogeneous population of runners. Some characteristics set our study apart from others like the large population size, the large number of variables studied and the comparison between trail runners and roadrunners.

Results

Amongst the 3669 runners, 1852 (50.5%) reported at least one injury over the last 12 months. Overuse injuries were largely represented (60.6%). The variables associated with RRI which remained significant in the fully-adjusted model were: previous injury (OR=1.62, IC 95% = 1.42-1.86), competitive running (OR = 1.53, IC 95% = 1.19-1.98), more than 2 hours running per week (OR = 1.28, IC 95%= 1.01-1.62), mileage (>20km/week) (OR = 1.25, IC 95%= 1.001-1.55) and stretching before running (OR = 0.68, IC 95%= 0.58-0.8) (Table 1 and 2)

Table 1: Risk factors of injuries (multivariate analysis)

	B coefficient	OR	95%CI	p-value
Gender (men)	-0.11	0.99	0.85-1.15	0.888
Age	0.001	1.001	0.99-1.008	0.795
Weight	0.006	1.006	1.00-1.012	0.039
Low importance of food	-0.21	0.81	0.65-1.002	0.052
Previous injury (yes)	0.485	1.62	1.42-1.86	<0.001
Competition (yes)	0.428	1.53	1.19-1.98	0.001
Races per year (>5)	0.143	1.15	0.99-1.35	0.07
Sessions per week (>2)	0.037	1.037	0.86-1.25	0.70
Hours per week (>2)	0.24	1.28	1.01-1.62	0.041
Kms per week (>20)	0.22	1.25	1.001-1.55	0.049
Pace (>11km/h)	0.139	1.15	0.99-1.34	0.07
Drop (>100 m/10km)	-0.153	0.86	0.73-1.01	0.86
Ground (Woods)	0.10	1.11	0.89-1.38	0.34
Ground (Tracks)	0.12	1.13	0.95-0.34	0.17
Stretching before (never)	-0.38	0.68	0.58-0.80	<0.001
Type of practice (trail)	0.16	1.17	0.97-1.41	0.10

Material and Methods:

Design: Retrospective online survey-based study among population of runners injured and non-injured.

Setting: Leisure road and trail runners

Patients: Participants have to be at least 18 years old and have to practice running at least for 12 months. 3669 runners reported information which were included for statistical analysis.

Assessment of risk factors: The online survey included 41 questions with five main categories: personal characteristics - daily lifestyle- training and running characteristics - practice of others sports activities and prevention habits.

Main outcome measurements: Occurrence of running-related injury over the last 12 months.

Table 2: Risk factors of injuries (univariate analyses)

	All (n=3669)	Uninjured (n=1817)	Injured (n=1852)	p-value*
Years of practice (year)	7.47±7.74	7.45 ± 7.5	7.49 ± 7.9	0.87
Type of practice				<0.001
Trail (%)	694 (18.9)	305 (16.8)	389 (21.0)	
Road (%)	976 (26.6)	556 (30.6)	420 (22.7)	
Both (%)	1999 (54.5)	956 (52.6)	1043 (56.3)	
Competition				<0.001
Yes (%)	3262 (88.9)	1543(84.9)	1719 (92.8)	
Nbre race/year > 5 (%)	2160 (57.4)	944 (37.3)	1162 (62.7)	<0.001
Session/week > 2 (%)	2226 (60.7)	997 (54.9)	1229 (66.4)	<0.001
Hour run/week > 2h (%)	2778 (75.7)	1268 (69.8)	1510 (81.5)	<0.001
Km/week > 20 km (%)	2482 (67.6)	1108 (61.0)	1374 (74.2)	<0.001
Pace > 11km/h (%)	1856 (50.6)	782 (44.9)	959 (53.0)	<0.001
Drop >100m/10km (%)	2566 (69.9)	1166 (67.1)	1270(70.5)	<0.001
Ground				
Wood (%)	3180 (86.7)	1547 (14.9)	1633 (88.2)	0.01
Road (%)	2106 (57.4)	1049 (57.7)	1057 (57.1)	0.69
Tracks (%)	753 (20.5)	331 (18.2)	422 (22.8)	<0.001
Other (%)	34 (0.9)	19 (1.0)	15 (0.8)	0.46
Stretching before running				<0.001
Never (%)	2747 (74.9)	1416 (77.9)	1331 (71.9)	
Yes, most of the time (%)	795 (21.7)	346 (19.0)	449 (24.2)	
Yes, always (%)	127 (3.5)	55 (3.0)	72 (3.9)	
Stretching after running				0.1
Never (%)	921 (25.1)	481 (26.5)	440 (23.8)	
Yes, most of the time (%)	1943 (53.0)	933 (51.3)	1010 (54.5)	
Yes, always (%)	805 (21.9)	403 (22.2)	402 (21.7)	

*P-value obtained from Student's T test for continuous variables and from Chi² test for categorical variables.

Conclusions:

Previous injury remains the most relevant RRI risk factor according to the current study and previous data. Many training characteristics seem to be involved but still have to be confirmed in view of conflicting data in the literature. Trail runners are more at risk of RRI. Further research would help to better understand RRI and how to prevent them.