Recent acute pre-race systemic illness in runners increases the risk of not finishing the race: SAFER study V

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ABSTRACT (271 words)

Aim

There are limited data on the negative effects of exercise in athletes with acute infective illness. The aim of this study was to determine whether a recently diagnosed pre-race acute illness in runners affects the ability to finish a race.

Methods

Runners were prospectively evaluated in the 3 days before the race for acute infective illness and then received participation advice using clinical criteria based on systemic or localized symptoms/signs. We compared the did-not-start and the did-not-finish frequencies of ill runners (Ill =172: localized = 58.7%; systemic = 41.3%) with that of a control group of runners (Con = 53 734).

Results

Runners with a systemic illness were 10.4% more likely not to start compared to controls (29.6% vs. 19.2%)(p=0.0073). The risk difference of not starting the race in runners who were advised not to run the race compared to controls was 37.3% (56.5% vs. 19.2%, p<0.0001). Compared with controls, runners with illness had a significantly (p<0.05) greater risk [any illness (5.2% vs. 1.6%), systemic illness (8.0% vs. 1.6%), illness < 24 hours before the race (11.1% vs. 1.6%)] and relative risk (Prevalence Risk Ratio – PRR) [any illness = 3.4, systemic illness = 4.9, systemic illness < 24 hours before the race = 7.0] of not finishing the race.

Conclusions

Runners with pre-race acute systemic illness, and particularly those diagnosed < 24 hours before race day, are less likely to finish the race, indicating a reduction in race performance and possibly an increase in the risk for medical complications.

INTRODUCTION

Is it safe for an athlete with recent or current symptoms of an acute illness to train or compete? This remains a challenging clinical decision for any Sport and Exercise Medicine (SEM) physician. There are only a small number of studies with evidence-based return-to-play (RTP) guidelines to assist SEM physicians in providing safe participation advice to an athlete with an acute illness [1, 2]. This is surprising, given that there are many studies showing that acute illness, particularly respiratory tract illness, are of the most common reasons for medical consultations in SEM clinics [3], as well as in tournament settings [4-14]. Respiratory tract (RT) symptoms may not always be due to an infection and it is important to consider other factors such as allergy [15] [16-19]. Risk factors for acute illness, particularly respiratory tract illness in athletes, include training load [19-23], environment [5], travel to a distant country [23, 24] and allergy [15, 25, 26].

The current RTP guidelines for athletes with acute respiratory tract illness are an adaptation of a clinical tool known as the 'neck check', which was first proposed in 1993 [27] and subsequently adapted by others [28-31]. This tool is based on localised (above the neck) vs. systemic (below the neck) symptoms and signs, but limited research data supports its use [1, 2]. In particular, we are not aware of any data where localised or systemic symptoms of acute illness affect exercise performance. We showed in a recent study that runners with self-reported symptoms of pre-race acute illness, who started a race, had a higher did-not-finish frequency (2.1%) compared to controls (1.3%)(p=0.0346), particularly runners with systemic symptoms (2.4%; RR=1.90) [32]. However, in this, and other previous studies [15, 20] [32, 33], the diagnosis of pre-event acute illness was based on self-reported symptoms only.

The aims of this study were to 1) document the type of acute illness in runners presenting to a Pre-Race acute Illness Medical Assessment (PRIMA) facility in the 3 days before a race, 2) determine if runners with acute illness advised to not start the race, did start and 3) determine if runners with acute illness, who decided to start the race, finished the race.

METHODS

Type of study
This was a prospective cohort study.

Study participants
All the runners who registered for the 56km or the 21.1km races in the 2013 and/or the 2014 Old Mutual Two Oceans Marathon in Cape Town, South Africa (n = 53 976) were considered as possible study participants. Runners who were concerned about symptoms of acute illness in the 3 days before the race had the opportunity of a free medical assessment at a Pre-Race acute Illness Medical Assessment (PRIMA) facility – part of the 'Medical Village' at the compulsory pre-race registration venue. We advertised the PRIMA facility in educational health emails sent out to all registered runners in the 3 months before the race, as well as on the event website and magazine. In 2013, a pre-race email invited runners concerned about acute illness to the medical facility before the race and in 2014 runners also received text messages 6 days and 4 days before the race. The main sponsor's stall, providing complimentary wellness checks (Including blood pressure, cholesterol and glucose), referred several runners with symptoms of acute illness to the PRIMA medical facility. The PRIMA facility was open for the duration of the Registration Expo in the three days prior to the race.

Pre-Race acute Illness Medical Assessment (PRIMA)- history and examination
We recorded all the data, including demographic information (name, gender and unique race number)

and the race for which they were registered, on Samsung electronic tablets (Galaxy Tab 2 V10.1; Korea). PRIMA staff (SEM physicians in 2013 and either nurses or SEM physicians in 2014) obtained a medical history, referring runners with any one (or more) of the following symptoms of an acute illness for a physical examination:

- Any systemic symptoms of infection: fever, myalgia, general body aches, excessive fatigue, malaise, arthralgia, or headaches.
- Any lower respiratory tract symptoms of infection: productive or non-productive cough, wheezing, "tight" chest, chest pain or shortness of breath.
- Gastro-intestinal symptoms: abdominal pain, cramps, nausea, vomiting, or diarrhoea.
- Any symptoms suggestive of cardiac disease: chest pain, shortness of breath, or palpitations.
- A sore throat.
- Any runners requesting a physical examination

A SEM physician conducted the general and specific physical examination in a private cubicle after informed consent by the runner. A nurse (in 2014), recorded vital sign investigations: tympanic thermometry (Braun Thermoscan, IRT 4520), resting blood pressure, and resting heart rate. The SEM physician conducted a general and specific systemic examination of the following systems: ear, nose and throat (ENT), respiratory, cardiac, abdominal, neurological or musculo-skeletal systems. We recorded and securely stored all clinical data, including the final working diagnosis and secondary diagnoses.

Diagnostic groups

Two clinicians assessed the clinical data of all runners with any upper or lower respiratory tract symptoms, gastro-intestinal symptoms or systemic symptoms of illness (fever, fatigue, malaise, myalgia, arthralgia, general body aches, headaches) to identify possible acute infection. Tympanic temperature and heart rate were considered in cases where the diagnosis of an infection was unclear. We considered a tympanic temperature $\geq$ 37.5 °C in males, and $\geq$ 37.1 °C in females to be above normal [34], and we used a resting HR of > 75 beats / min as an indicator of possible infection, in the context of appropriate symptoms and clinical signs. A sinus bradycardia (< 60 beats / min) is seen in up to 80% of trained endurance athletes [35] and the resting HR can increase by 10-15 beats / min with infection [36].

We assigned diagnostic codes to categorise illness in runners as localised or systemic as follows. We defined a localised illness as either a localised URT illness that included rhinitis (infected or not infected), pharyngitis, laryngitis, sinusitis (congestion) or any other localised illness. In the absence of an exudate or any systemic features, we classified cervical lymphadenopathy with localised throat

erythema, as a localised pharyngitis. In cases where clinicians recorded two diagnoses of localised illness in a runner, we categorised the illness as a localised illness.

We defined systemic infective illness as an URTI with systemic features, other systemic infective illness (mostly 'flu'-like illnesses), suspected myo-pericarditis, LRTI and gastro-enteritis. In the case where a runner presented with symptoms and signs of both a 'localised' illness and a systemic illness, we categorised the illness as systemic.

Advice given to runners reporting to the PRIMA facility

On completion of the medical assessment at the PRIMA facility, medical staff gave runners advice regarding participation on race day. In the illness group, we based advice on the current RTP clinical guidelines, using the differentiation between a localised illness, and a systemic illness (Supplementary Table).

Race day data - race starting and finishing

We tracked all runners during race day with an electronic 'Champion-chip' attached to one of the runner's shoes. The runners crossed mats at the starting line, along the route and at the finish line, allowing the chip data to be identified and recorded. We categorised runners as 'non-starters' (DNS) if any of the course mats (at the start, on the course, or at the finish) captured no data, and 'non-finishers' if the mat at the finish line captured no data.

Main measures of outcome

- The prevalence (%) of runners with symptoms, a clinical diagnosis and the diagnostic category (localised vs. systemic) of runners in the Illness group
- The frequency (%) of runners who were given advice not to run (ANR)
- The absolute and relative risk of runners with illness not starting the race (DNS)
- The absolute and relative risk of runners with illness not finishing the race (DNF)

Research Ethics and Informed consent

Research Ethics approval for this study was obtained from the Research Ethics Committee of the Faculty of Health Sciences of the University of Cape Town prior to starting the study (REC: 441/2012). The Research Ethics Committee of the Faculty of Health Science at the University of Pretoria (433/2015) also approved the study.

Statistical analysis of data

We used a Poisson regression model, using a robust error estimator (log link function), to analyse each individual symptom group, and sub-groups. This cohort consists of correlated data, which we

accounted for by using an unstructured correlation matrix. We estimated the Prevalence Risk Ratio (PRR), Risk Difference (RD) and 95% confidence intervals (CI) by a modified Poisson regression using robust error variances and considered P-values of <0.05 as statistically significant. In addition, we report both absolute risk (%) and risk differences (% difference) between groups.

RESULTS

Demographics of the study population

We assessed a total of 242 runners in the two years of the study and excluded 70 runners diagnosed with a non-infective illness. Therefore, a total of 172 runners had symptoms and signs suggestive of acute infective illness and this comprised the Illness study cohort (0.3% of all race registrants). The remaining runners who did respond to the PRIMA facility at registration (n=53 734) were the Control group of runners for this study. We compared outcome variables for the Illness group (main cohort) and that of the Control group.

The sex distribution in the Illness group was similar to that of the Control group in both the 56km- and the 21.1km races. Of the 66 runners in the 56km Illness cohort, 52 (78.8%) were male and 14 were female (21.2%). Of the 21 343 runners in the Control group that registered for the 56km race, 15 508 (72.7%) were male, and 5 835 (27.3%) were female. Among the 106 runners in the 21.1km Illness cohort, 48 (45.3%) were male and 58 (54.7%) were female. Of the 32 391 runners in the Control group that registered for the 21.1km race, 15 932 (49.2%) were male, and 16 459 (50.8%) were female.

Prevalence of symptoms, clinical diagnosis and diagnostic category (localised vs. systemic) of runners in the Illness group

Some of the 172 runners in the Illness group reported up to 8 symptoms. Sinus congestion (40.1%), followed by cough (38.4%, and divided evenly between productive and non-productive types), sore throat (37.8%), runny nose (25.6%), fever (13.4%) and fatigue (12.8%) were the most common symptoms (suffered by >10% of runners in the Illness group).

We based the final diagnosis on clinical assessment, and 11 runners were assessed by medical history only, while 161 were assessed by medical history and physical examination. Of the 172 runners in the Illness group, 101 (58.7%) had a localized illness, and 71 (41.3%) a systemic illness (Table 1).

Table 1. The final clinical diagnosis in the Illness group (n=172)

Clinical diagnosis			n	% of illness group
Localized Illness (n=101)	Localized URTI	All localized URTI	99	57.6
		Sinusitis	36	20.9
		Pharyngitis	30	17.4
		Rhinitis (non-infective)	28	16.3
		Laryngitis	3	1.7
		Rhinitis (infective)	2	1.2
	Other localized infective illness		2	1.2
Systemic illness (n=71)	URTI with systemic symptoms		39	22. 7
	LRTI		18	10.5
	Infective gastroenteritis		9	5.2
	Other systemic infective illness		4	2.3
	Suspected myo-pericarditis		1	0.6

URTI: Upper Respiratory Tract Illness
LRTI: Lower Respiratory Tract Illness

The proportions of runners in the illness sub-groups varied on the different days that runners were evaluated before the race. Almost half (49.4%) of runners with illness (85 of the 172 runners with illness) were evaluated in the 24 hours before the race started, during which the largest proportion of runners with systemic illness was seen (46.5%) (33 runners of the 71 runners with systemic illness).

Advice given to runners with acute illness

We provided educational information to 143 of the 172 runners (83.1%) of the Illness group, and 11 runners that we assessed after a medical history only, were in this group. We advised 23 runners (13.4%) with a suspected systemic illness not to run, based on a clinical diagnosis (medical history and physical examination). Of these runners, 12 had a LRTI, 6 a generalised URTI, four a systemic illness and in one, we suspected a myo-pericarditis.

Absolute and relative risk of not starting the race

Absolute and relative risk of not starting the race in all runners:
Of all the 53 976 runners who registered for the race in 2013 and 2014, 10 358 (19.2 %) did not start the race. In the Control group of 53 734 runners, 10 309 were non-starters (19.2%). Within the Illness group of 172 runners, 38 did not start (22.1%). Runners in the Illness group did not have a significantly higher absolute risk (risk difference = -3.5%, 95%CI –9.7-2.7)(p=0.2630) or relative risk (PRR =1.16, 95%CI 0.89-1.52) (p=0.2693) of not starting the race [adjusted for the demographic variables of year of race, gender and race type (21.1km vs 56km)].

Absolute and relative risk of not starting the race in the Control and Illness group and the Illness sub-groups based on advice given:

The did-not-start frequencies, prevalence risk ratio and risk differences [adjusted for the demographic variables of year of race, gender and race type (21.1km vs 56km)] in the Control group and the Illness group, based on advice given, are depicted in Table 2.

Table 2: The did-not-start (DNS) frequencies, risk differences (RD), and prevalence risk ratio (PRR) in the Control and Illness groups, based on advice given (adjusted for demographic variables: year of race, race type (21.1km and 56km) and gender)

	Starters		DNS		RD (%) vs. Control [a]	P values [b]	PRR vs. Control [c] (95% CI)	p-value [d]
	N	%	N	%	%			
Control group (n=53 734)	43 425	80.8	10 309	19.2	-			
Illness group (n=172)	134	77.9	38	22.1	- 3.5 (-9.5-2.7)	0.2630	1.16 (0.89-1.52)	0.2693
Information (n=143)	119	83.2	24	16.8	- 1.9 (-8.1-4.3)	0.5493	0.88 (0.62-1.25)	0.4679
Advised not to run (n=23)	10	43.5	13	56.5	40.0 (19.7-60.3)	0.0001	3.07 (2.18-4.32)	<0.0001
Other advice (n=6)	5	83.3	1	16.7	-	-	0.94 (0.19-4.54)	0.9387

[a] RD – Risk difference – adjusted for demographic variables: year of race, race type (21.1km and 56km), gender
[b] p-value: Pair wise vs. Control group for RD
[c] PRR (Prevalence Risk Ratio) – adjusted for demographic variables: year of race, race type (21.1km and 56km), gender
[d] p-value: Pair wise vs. Control group for PRR

Within the Illness group, 13 of the 23 runners (56.5%) who were advised not to run, did not start the race. The absolute and relative risk of not starting the race was not different in the sub-group of runners who received information only or other advice, compared to the Control group. However, the absolute (PRR=3.1, 95%CI 2.2-4.3; p<0.0001) and relative risk (RD=40.0%, 95%CI 19.7-60.3; p=0.0001) of not starting the race was significantly higher in the sub-group of runners who were advised not to run, compared to the Control group. With respect to athlete compliance, these data indicate that 43.5% of runners in this group were non-adherent to advice.

Absolute and relative risk of not starting the race in the Control and Illness sub-groups with either localised or systemic illness:

Of the 172 runners in the Illness group, 101 (58.7%) had a localised illness and 71 (41.3%) had a systemic illness. The absolute (RD) and relative risk (PRR)(adjusted for year of race, race type, and gender) of not starting the race in the sub-group of runners with localised illness and systemic illness reported > 24 hours before the race was not different to that in the Control group (Table 3).

Table 3: The did-not-start (DNS) frequencies, risk differences (RD), and prevalence risk ratio (PRR) in the Control and Illness group (and sub-groups of localised vs. systemic illness) diagnosed in two time periods before the race (adjusted for demographic variables: year of race, race type (21.1km and 56km) and gender)

	Starters		DNS		RD (%) vs. Control [a]	P values [b]	PRR vs. Control [c] (95% CI)	p-value [d]
	N	%	%	%	%			
Control group (n=53 734)	43 425	80.8	10 309	19.2				
Illness group (n=172)	134	77.9	38	22.1	- 3.5 (-9.5-2.7)	0.2630	1.16 (0.89-1.52)	0.2693
Localised illness (n=101)	84	83.2	17	16.8	-2.0 (-9.4-5.4)	0.6046	0.87 (0.57-1.33)	0.5265
Systemic illness (n=71)	50	70.4	21	29.6	11.6 (1.1-22.2)	0.0309	1.59 (1.13-2.23)	0.0073
> 24 hours before race (n=38)	32	84.2	6	15.8	-1.6 (-13.6-10.5)	0.8005	0.89 (0.46-1.74)	0.7403
< 24 hours before race (n=33)	18	54.5	15	45.5	27.1 (10.4-43.8)	0.0015	2.38 (1.67-3.41)	<0.0001

[a] RD – Risk difference – adjusted for demographic variables: year of race, race type (21.1km and 56km), gender
[b] p-value: Pair wise vs. Control group for RD
[c] PRR (Prevalence Risk Ratio) – adjusted for demographic variables: year of race, race type (21.1km and 56km), gender
[d] p-value: Pair wise vs. Control group for PRR

The absolute and relative risk of not starting the race was significantly higher in the sub-group of runners with systemic illness, compared to the Control group. Similarly, compared to the Control group, the absolute and relative risk of not starting the race was significantly higher in the sub-group of runners who reported systemic illness <24 hours before the race. However, these data should be interpreted with some caution as the numbers of non-starters in these sub-groups were small.

Absolute and relative risk of not finishing the race

The did-not-finish frequencies and prevalence risk ratio (adjusted for year of race, race type, and gender) in the Control group, Illness group, and sub-groups of the Illness group (localised or systemic illness) are depicted in Table 4. The absolute risk could not be calculated due to small numbers of non-finishers and non-convergence.

Table 4: The did-not-finish DNF frequencies and prevalence risk ratio (PRR) in the Control and Illness groups (and sub-groups of localised vs. systemic illness) diagnosed in two time periods before the race (adjusted for demographic variables: year of race, race type (21.1km and 56km) and gender)

Starters	Finishers		DNF		PRR vs. Control [a] (95% CI)	p-value [b]
	N	%	N	%		
Control group (n=43 425)	42 750	98.4	675	1.6		
Illness group (n=134)	127	94.8	7	5.2	3.40 (1.76-6.58)	0.0003
Localised illness (n=84)	81	96.4	3	3.6	2.45 (0.85-7.07)	0.0986
Systemic illness (n=50)	46	92.0	4	8.0	4.87 (2.20-10.75)	<0.0001
> 24 hours before race (n=32)	30	93.7	2	6.3	3.73 (1.20-11.65)	0.0233
< 24 hours before race (n=18)	16	88.9	2	11.1	7.03 (2.37-20.83)	0.0004

[a] PRR (Prevalence Risk Ratio) – adjusted for demographic variables: year of race, race type (21.1km and 56km), gender
[b] p-value: Pair wise vs. Control group for PRR

In the 84 starters who had localised illness, three did not finish (3.6%), two of whom were evaluated the day before the race. In the 50 runners who started the race despite having a systemic illness, four did not finish (8.0%). Two of these non-finishers were amongst the 32 runners who were evaluated >24 hours before the race (6.3%) and the remaining two non-finishers were amongst the 18 runners evaluated within 24 hours of the race start (11.1%).

The absolute risk (unadjusted DNF) (% runners) of not finishing the race was 1.6% in the Control group and 5.2% in the Illness group. In the systemic illness group 8.0% runners did not finish the race, and this was 6.3% and 11.1% respectively for runners with systemic symptoms >24 hours, and <24 hours before the race. As a result of the small sample size in the Illness sub-groups, the adjusted absolute risk (risk differences) for the DNF groups could not be obtained.

The relative risk (PRR) of not finishing the race in the sub-group of runners with localised illness was not different to that in the Control group, but was significantly higher in the Illness group and sub-group of runners with systemic illness compared to the Control group. Similarly, compared to the Control group, the relative risk of not finishing the race was significantly higher in the sub-group of runners who reported systemic illness >24 hours and <24 hours before the race,. These data should be interpreted with some caution as the numbers of runners in these sub-groups were small.
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DISCUSSION

This study investigated the race outcomes (DNS, DNF) based on diagnosis and adherence to advice given by healthcare practitioners of runners presenting with acute illness in the 3 days before an endurance race (21.1km and 56km). Our main findings are: 1) 43.5% of the runners in the Illness group were non-adherent to advice given and started the race - including 29.6% of runners with systemic illness, 2) runners with localised illness started and finished the race in a similar proportion to control runners, 3) runners in the Illness group had a significantly higher risk of not finishing the race, and this was highest in runners with systemic illness in the 24 hours preceding the race start. However, this last finding needs to be interpreted with some caution because of the small numbers.

In our study, the did not start frequency for the total race population (19.2%) is lower than that previously reported in the literature [37, 38], but higher than our more recently reported did not start frequency of 6.6% [32]. We educated runners on the importance of monitoring symptoms as these could change over time (particularly those that we saw > 24 hours before the race). We emphasised that runners can make an informed decision about their fitness to compete on race day, based on their symptoms. In our illness group, we used the frequency of not-starting the race as a measure of 'adherence to advice' given to the runners. We do acknowledge that acute illness may not have been

the only reason for not starting the race and that a number of other factors could affect the decision to start the race.

In our study, 43.5% of runners with acute illness were non-adherent and started the race. Runners with systemic illness were significantly less likely to start than runners in the control group, or runners with localised illness. This was even more significant in runners we evaluated < 24 hours before the race, and we attribute this to the minimal time for improvement of their clinical condition. Of interest was that some of the 56km runners we advised against running, expressed a wish to participate in the 21.1km race instead, perceiving it as less 'risky'. This is in keeping with the observations reported during the Aberdeen marathon, where a third of the 'drop-out' respondents indicated they would have entered a half-marathon if given the option [38]. Finally, we are not aware of any data exploring the concept of adherence to advice by athletes that have evidence of acute illness, and we suggest that further research be conducted to explore this area.

In this study, not finishing the race is used as a proxy for the impact of an acute illness on race performance. Our results show that 3.6% of runners with localised illness did not finish the race compared to 1.6% in the Control group, and these data are similar to the 1.9% runners with self-reported pre-race localised symptoms that we reported from our recently published data [32]. These two studies are, to the best of our knowledge, the first clinical data from prospective studies to indicate that the return-to-play (RTP) criteria if only localised symptoms and signs present, is a useful and valid clinical tool to advise athletes with acute illness on RTP. However, we encourage further research in this area, particularly with more specific diagnoses and larger sample sizes, and more accurate measures of performance (*e.g.* split and finishing times compared to previous or personal best running times).

However, we also show that, compared with runners in the Control group, 5.2% of runners in the Illness group, and 8% of runners in the systemic illness group, did not finish the race (relative risks of 3.40, and 4.87 respectively). These findings are also similar to the did-not-finish frequencies we recently reported for runners with any self-reported illness (2.1%) and self-reported systemic symptoms (2.4%) [32]. However, a novel finding in this study was that 11.1% of runners with clinically diagnosed systemic illness in the 24-hour period just before the race did not finish the race (relative risk of 7.03 higher than Control; p=0.0004). This finding has important clinical implications and suggests that recent clinically diagnosed systemic illness (< 24hrs before exercise) significantly affects exercise performance and may also have health implications. However, it is important to note that these findings should be interpreted with some caution due to the small numbers of participants in these sub-groups, and further studies with larger sample sizes are needed.

Our study also has several limitations including: 1) runners who presented to the PRIMA facility were self-selected, 2) the prevalence of acute illness in the entire race population is not known, 3) reasons for not starting or finishing are not known and, 4) the sample sizes in sub-groups of runners are too small to conduct detailed analysis. Further studies with larger numbers are needed, and we suggest further investigations to determine the link between acute illness and medical complications during exercise.

CONCLUSION

Among runners with a clinically diagnosed pre-race acute infective illness, this is mostly localised to the upper respiratory tract, but a significant number of runners have an URTI with generalised symptoms. Of the runners with acute illness who were advised not to run, 43.5% ran anyway. In runners with illness, and sub-groups of runners with systemic illness or systemic illness less than 24 hours before the race, who ran anyway, the risk of not finishing the race was 3.6%, 8.0% and 11.1% respectively compared to controls (1.6%). Therefore, runners with systemic illness, and particularly those diagnosed < 24 hours before race day, were less likely to finish the race, indicating a reduction in race performance and possibly an increase in the risk for medical complications. These data are important to improve the medical care of runners (and other athletes) presenting with acute illness before training and competition. \

What are the main clinical findings?

- 43.5% of runners with an acute infective illness, clinically diagnosed in the 3 days before a race, are non-adherent to advice not to run the race.
- Runners with systemic illness who elect to start the race despite being advised not to, have an 8% chance of not finishing the race, compared with runners in the Control group of 1.6% (relative risk of 4.87).
- If diagnosed with an acute systemic illness within 24 hours of the race, 11.1% of runners do not finish the race compared with 1.6% of runners in the Control group (relative risk of 7.03).

How it might impact on clinical practice in the near future

- Sport and Exercise Medicine physicians can expect that only about 50% of recently diagnosed acutely ill runners will adhere to advice about not participating in a race

- Runners with systemic symptoms and signs of acute pre-race illness have an increased risk of not completing the race – more so if systemic symptoms and signs are present in the 24hours before a race

Competing Interests:

The authors declare that there are no competing interests

Data sharing statement:

No additional data are available

Contributorship:

Leigh Gordon (LG): study planning, data collection, data interpretation, manuscript drafting and editing

Martin Schwellnus (MS): responsible for the overall content as guarantor, study concept, study planning, data collection, data interpretation, manuscript (first draft), manuscript editing, facilitating funding

Wayne Derman (WD): study planning, data collection, data interpretation, manuscript editing

Sonja Swanevelder (SS): study planning, data analysis including statistical analysis, data interpretation, manuscript editing

Esme Jordaan (EJ): study planning, data analysis including statistical analysis, data interpretation, manuscript editing

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