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INDEPENDENT RISK FACTORS ASSOCIATED WITH ILLNESS-RELATED MEDICAL ENCOUNTERS DURING A 109 KM CYCLING EVENT ARE FEMALES, OLDER AGE, SLOWER CYCLING SPEED AND WARMER ENVIRONMENTAL CONDITIONS: A SAFER STUDY IN 102251 RACE STARTERS

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Background Illness-related medical encounters (illMEs) are common in mass community-based participation cycling events, but there are limited data on risk factors associated with illMEs in endurance cycling events.

Objective To determine the independent risk factors associated with illMEs in a mass community-based endurance cycling event.

Design Retrospective, cross-sectional study.

Setting 2012–2014 Cape Town Cycle Tour (109 km), South Africa.

Participants 102251 race starters.

Assessment of Risk Factors All illMEs and a subgroup of serious illMEs for 3 years were recorded and also grouped into common illnesses by organ system affected. The following possible risk factors associated with illMEs were explored: sex, age, cycling speed and environmental exposure [calculated as average individual Wet-Bulb Globe Temperature (aiWBGT)].

Main Outcome Measures Independent risk factors associated with illMEs, serious illMEs, and illMEs by organ system affected using a Poisson regression model.

Results Independent risk factors associated with all illME during an endurance cycling event were slow cycling speed ($P=0.009$) and higher aiWBGT ($P<0.001$). Risk factors associated with serious and life-threatening or death ME were older age ($P = 0.007$) and slower cycling speed ($P = 0.016$). Risk factors associated with specific common illME were fluid and electrolyte disorders (females, older age, and higher aiWBGT) and cardiovascular illness (older age).

Conclusions Females, older age, slower cycling speed, and higher aiWBGT were associated with illME in endurance cycling. These data could be used to design and implement future prevention programs for illME in mass community-based endurance cycling events.

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EXPERIENCED RUNNERS WITH AN ABOVE AVERAGE TRAINING LOAD HAVE THE HIGHEST RISK OF EXERCISE ASSOCIATED MUSCLE CRAMPING (EAMC)

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Background Running experience and training may be risk factors for exercise associated muscle cramping (EAMC).

However, multiple experience and training variables are inter-dependent. A latent class variable may be used to test associations between multiple experience and training variables and EAMC.

Objective Is there an association between EAMC and a latent class training variable, based on multiple inter-dependent experience and training variables?

Design Cross-sectional study.

Setting Two Oceans Marathons 2012–2015.

Patients (or Participants) 76211 consenting race entrants.

Interventions (or Assessment of Risk Factors) Runners completing a pre-race screening questionnaire reported a history of EAMC and multiple experience and training variables: years of recreational running, years of racing, weekly training frequency, 12 months training distance, average training speed. Multiple experience and training variables were used to inform a latent class variable dividing runners into mutually exclusive classes so as to best explain the meaning of the chosen classes. Five experience/training classes (ET classes) were identified: ET class 1 (less experienced runners, lowest training) (64%), ET class 2 (average experience, average training) (18%), ET class 3 (fairly experienced, above average training) (8.6%), ET class 4 (2nd least experience, training far above average) (6.4%), ET class 5 (very experienced, above average training) (3%).

Main Outcome Measurements Prevalence of EAMC (%) by ET classes (1–5).

Results There were significant differences in EAMC prevalence among ET classes ($p<0.0001$). EAMC prevalence was highest in ET class 5 (27%) (very experienced, above average training) vs. ET class 1 (11%) (less experienced runners, lowest training).

Conclusions Runners with more experience and an above average training profile had the highest prevalence of EAMC. Using ET classes to categorise runners by experience and training, instead of multiple individual inter-dependent training variables, may be more informative to explore relationships between running experience, training variables and medical conditions such as EAMC.

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ABSTRACT WITHDRAWN

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THE USE OF ARTIFICIAL INTELLIGENCE TOOLS TO ESTIMATE RUNNING-RELATED INJURY RISK PROFILES IN RECREATIONAL RUNNERS

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Background The development of running-related injury (RRI) prevention programmes is based on aetiology described in longitudinal studies. Such studies have been conducted assuming that risk factors may influence the occurrence of RRIs under

a linear system approach. Such approach has not been successful in explaining and/or predicting RRIs satisfactorily.

Objectives To develop and validate an artificial intelligence (AI) algorithm in order to identify RRI risk profiles in recreational runners.

Design Mathematical model.

Settings São Paulo, Brazil.

Participants 191 recreational runners.

Assessment of Risk Factors This was a 3-step AI study using data from a prospective cohort study. In step 1, variable selection and exploratory analyses were conducted in the original (n=191) and simulated data (n=5000). In step 2, the AI algorithm was developed using self-organising maps, k-means and probabilistic neural networks. The algorithm was trained in 80% (n=4000) of the simulated data, and validated using the remaining 20% (n=1000). Characterisation of RRI risk profiles was performed in step 3.

Main Outcome Measures RRI risk profiles were established based on the groups created by the developed algorithm. Descriptive analyses were performed to summarise the risk profiles.

Results The variables with greatest influence in the algorithm were: sex; running intensity; history of RRIs; and current musculoskeletal discomfort related to running. Five groups were suggested by the algorithm. Male runners reporting previous RRIs and running in low-to-moderate intensities (>6 min/km) were at the highest risk of RRIs. Male runners reporting previous RRIs and running in high intensities (3 to 5 min/km) in about 32.1% of the time were at the lowest risk of RRIs. The classification accuracy of the algorithm presented a median of 99.6% (interquartile range: 99.5% to 99.8%).

Conclusions A non-linear system approach using AI and machine learning techniques were successful in developing an RRI risk profile algorithm for recreational runners.

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ENVIRONMENTAL FACTORS, TRAINING FACTORS, RACE PACE AND DISTANCE, OLDER AGE, AND METABOLIC/ ENDOCRINE DISEASE ARE INDEPENDENT RISK FACTORS ASSOCIATED WITH ADVERSE EVENTS IN RUNNERS: A SAFER STUDY IN 76654 STARTERS

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Background Pre-race medical screening at endurance events has recently been suggested, but there are limited data on the use of pre-race questionnaire data to predict adverse events (defined as medical encounters or not finishing a race).

Objective To determine if risk factors, that are identified from a pre-race medical screening questionnaire, are associated with adverse events during a distance running event.

Design Prospective study, with cross-sectional analyses.

Setting 2012–2015 Two Oceans marathon races (21.1 km, 56 km), South Africa.

Patients (or Participants) 76654 race entrants (21.1 km and 56 km race).

Interventions (or Assessment of Risk Factors) Upon entering the race, all entrants completed a pre-race medical screening questionnaire. Based on the responses to the questionnaire, runners received a targeted educational intervention to reduce medical encounters (ME). All individual race day data was collected, and this included AE data as follows: runners that did-not-finish (DNF) the race (collected from the race organisers), and runners who had a medical encounter (ME) (collected by race day medical staff).

Main Outcome Measurements Using a multiple regression model, we report the prevalence ratio (PR: 95% CI) of risk factors associated with the adverse event rate (AE) (defined as DNF or ME), using race day data and individual pre-race medical screening data.

Results Independent risk factors associated with AE in the Two Oceans Races were: males >45years (1.2: 1.0–1.3; p=0.0210), females >55years (1.5: 1.1–2.1; p=0.0051), slower training pace (increase of 1min/km, 1.2: 1.1–1.2; p<0.0001), increased training frequency per week (increase of 2 times/week, 1.2: 1.1–1.3; p=0.0017), and a history of metabolic/endocrine disease (1.6: 1.2–2.1; p=0.0006).

Conclusions Environmental and training factors, older age, race pace and distance, and history of metabolic/endocrine disease were independent risk factors associated with adverse events in a mass-participation distance running event. These factors could be considered when developing and implementing pre-race education material that is disseminated to participants prior to the event.

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SELF-REPORTED MEDICAL CONDITIONS/MEDICATION USE, OLDER FEMALES, AND SLOW PACE ARE INDEPENDENT RISK FACTORS FOR ALL MEDICAL ENCOUNTERS IN A 90 KM ULTRAMARATHON: A SAFER STUDY IN 70328 RUNNERS OVER 5 YEARS

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Background There is a high incidence of medical encounters (MEs) in ultramarathon road running races but risk factors associated with MEs in events have not been well investigated.

Objective To determine the independent risk factors for all medical encounters in a 90km ultramarathon running race.

Design Retrospective clinical audit, cross-sectional analysis

Setting 2014–2018 Comrades ultramarathon (90 km, alternating annually between an ‘up’ vs. a ‘down’ run between a coastal and inland city), South Africa

Participants 70328 race starters

Interventions All participants voluntarily completed two medical-related questions (history of allergies and/or a medical condition/or use medication) upon entry for the event. Race day data, including ‘up’ vs. ‘down’ run, start time, finish time, age and sex of starters, was recorded by the race organisers. MEs were recorded by medical staff during and immediately after the event.