

Previous injuries and some training characteristics predict running-related injuries in recreational runners: a prospective cohort study

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Questions: What is the incidence of running-related injuries (RRIs) in recreational runners? Which personal and training characteristics predict RRIs in recreational runners? **Design:** Prospective cohort study. **Participants:** A total of 200 recreational runners answered a fortnightly online survey containing questions about their running routine, races, and presence of RRI. These runners were followed-up for a period of 12 weeks. **Outcome measures:** The primary outcome of this study was running-related injury. The incidence of injuries was calculated taking into account the exposure to running and was expressed by RRI/1000 hours. The association between potential predictive factors and RRIs was estimated using generalised estimating equation models. **Results:** A total of 84 RRIs were registered in 60 (31%) of the 191 recreational runners who completed all follow-up surveys. Of the injured runners 30% (n = 18/60) developed two or more RRIs, with 5/18 (28%) being recurrences. The incidence of RRI was 10 RRI/1000 hours of running exposure. The main type of RRI observed was muscle injuries (30%, n = 25/84). The knee was the most commonly affected anatomical region (19%, n = 16/84). The variables associated with RRI were: previous RRI (OR 1.88, 95% CI 1.01 to 3.51), duration of training although the effect was very small (OR 1.01, 95% CI 1.00 to 1.02), speed training (OR 1.46, 95% CI 1.02 to 2.10), and interval training (OR 0.61, 95% CI 0.43 to 0.88). **Conclusions:** Physiotherapists should be aware and advise runners that past RRI and speed training are associated with increased risk of further RRI, while interval training is associated with lower risk, although these associations may not be causative. [Hespanhol Junior LC, Costa LOP, Lopes AD (2013) Previous injuries and some training characteristics predict running-related injuries in recreational runners: a prospective cohort study. *Journal of Physiotherapy* 59: 263–269]

Key words: Athletic injuries, Epidemiology, Etiology, Follow-up studies, Incidence, Risk factors, Running, Sports

Introduction

Running is widely known to be beneficial for general health (Marti 1991, Williams 1997, Williams 2007, Williams 2008). However, one of the consequences of running is running-related injuries (RRI), with incidence rates ranging from 18.2% to 92.4% (Satterthwaite et al 1999, van Gent et al 2007, Van Middelkoop et al 2008a) or 6.8 to 59 injuries per 1000 hours of running exposure (Bovens et al 1989, Buist et al 2010, Lun et al 2004, Lysholm and Wiklander 1987, Rauh et al 2006, Wen et al 1998). This large variability may be explained by differences in the target populations investigated, such as recreational (Lun et al 2004) or ultramarathon runners (Scheer and Murray 2011), and in the definitions of RRI used (Jacobs and Berson 1986, Lun et al 2004, Pileggi et al 2010, van Gent et al 2007).

Most runners run exclusively for fun and often complete just a few kilometres per training session. Some of them do not participate in running races at all. These recreational runners are probably the most common cohort within the running community. Few observational studies have investigated prospectively the incidence and risk factors of RRI in recreational runners who were not enrolled or not training to participate in races (Lun et al 2004, Macera et al 1989). The risk factors for RRI that have been identified in this population are: previous injuries, running more than 64 km/week, and less than three years of running experience

(Macera et al 1989). We are unaware of prospective observational studies that controlled important aspects of training (duration of training sessions, speed training, and interval training) and the level of motivation to run in this population. Information about predictive factors for running injuries is essential for sports physiotherapists and other healthcare professionals for the development of prevention strategies for running injuries. Therefore the objectives of

What is already known on this topic: Running-related injuries are common and frequently cause absence from running. Studies among recreational runners have identified previous injuries, running more than 64 km/week, and less than 3 years of running experience as being associated with increased risk of running-related injury.

What this study adds: Over a 12-week period, 31% of recreational runners sustained a running-related injury severe enough to prevent participation in running for at least one usual training session. Predictors of increased injury risk included a previous running-related injury, higher duration of training (although the increase in risk was very small), and the use of speed training. The use of interval training was predictive of reduced injury risk.

this study were to determine the incidence of RRI in the lower limbs and spine in a sample of recreational runners, and to determine which training or personal characteristics may be considered predictive factors for RRI in this population.

Method

Study design

This is an observational injury surveillance study with a prospective cohort design that included 200 recreational runners who responded to an online survey with questions related to their running training routine, races and RRI. The recreational runners were followed-up for a period of 12 weeks, during which the online surveys were answered every two weeks.

Participants

To be included in the study, runners had to be at least 18 years old and to have been running for at least six months. Runners were excluded if they had either any medical restriction to running or any musculoskeletal injury that could preclude their participation in running training sessions.

Recruitment and baseline survey

A total of 4000 runners who were registered on the database of a running promoter were invited by email to participate in this study. This email provided information about the study procedures and contained a link to an electronic consent form. After agreeing to participate, the individuals were directed to a website that contained the baseline survey. The first 200 runners who agreed to participate in the study, met the inclusion criteria, and fully completed the baseline survey were included. This survey contained questions regarding personal characteristics, running routines, and previous RRI. Also a specific question was included to confirm that runners were injury-free before starting the follow-ups. All questions and details about the baseline survey are described in Appendix 1 (see eAddenda for Appendix 1) and were published elsewhere (Hespanhol Junior et al 2012).

Follow-up survey and outcome measures

Data collection consisted of six follow-up surveys (Appendix 2, see eAddenda for Appendix 2) sent to the runners by email every 14 days throughout the 12-week study period. Messages were sent by email every two weeks to remind the participants to complete the online survey for the previous fortnight. A reminder email was sent if the survey was not completed in three days. If runners had not completed the survey eight days after the initial email, they were then contacted by phone to remind them to complete the survey either online or over the phone. A reminder letter was sent by regular mail with a pre-paid return envelope if none of the previous reminder attempts was successful. Participants who received a reminder by regular mail could complete a printed survey that had the same questions as the online version. In order to minimise the recall bias in the information collected in these follow-up surveys, we sent all runners a running log by regular mail to help them to record each running session. We requested that participants complete the running log with all relevant information and transfer these data while completing the fortnightly follow-up survey.

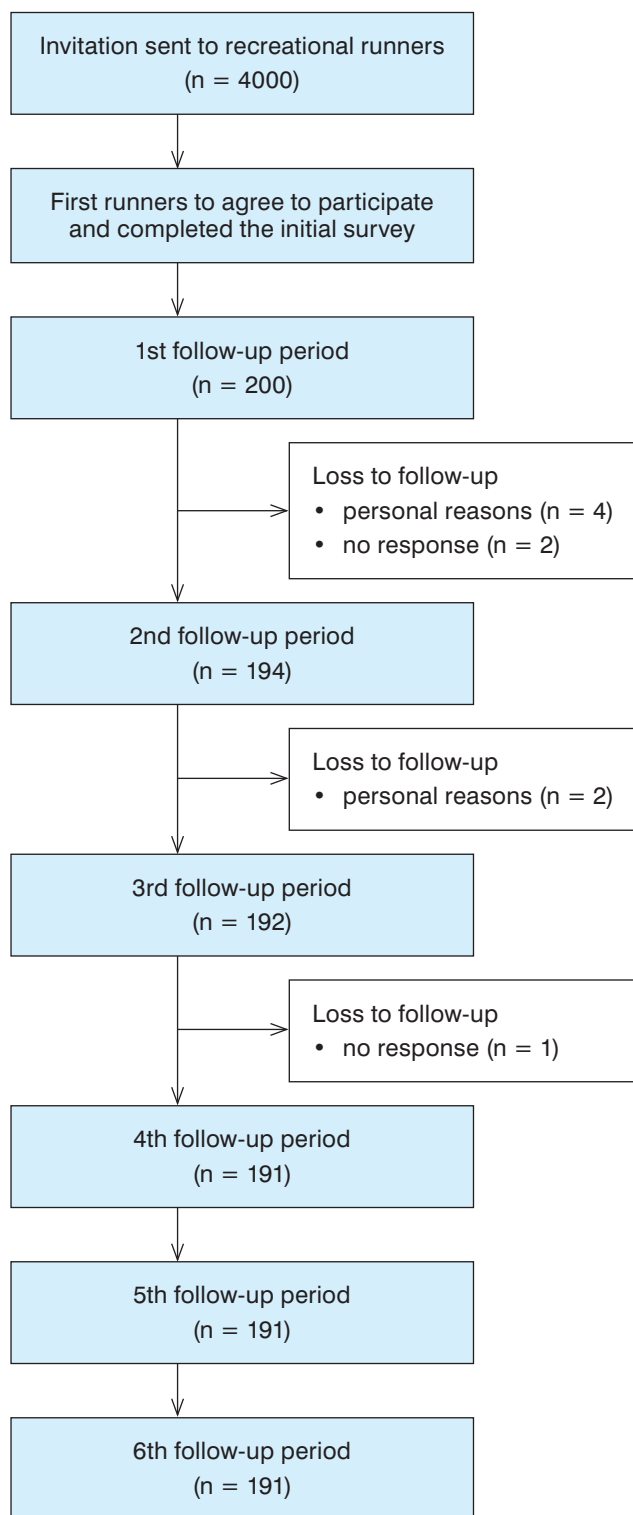


Figure 1. Flow of participants through the study.

The follow-up survey contained information about training, the presence of any RRI during the period, motivation to run, and any running races that the participant had competed in over the preceding two weeks. These questions elicited information about the following variables: number of times that the participant had trained; the total distance run (in kilometres); average time for each running session; predominant type of training surface (asphalt, cement, grass, dirt, sand, gravel); predominant type of terrain (flat course, uphill, downhill, or mixed); amount of speed

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