# EPIDEMIOLOGICAL STUDY OF SPANISH RECREATIONAL RUNNERS

**Javier Rueda[1], Archit Navandar[1], Carlos Garcia[1], Gonzalo Torres[1], David Chorro[1], Albaladejo R[2], Villanueva R[2] and Enrique Navarro[1].**

**Faculty of Sports Sciences, Technical University of Madrid, Madrid, Spain[1]**

**Faculty of medicine, Complutense University of Madrid, Madrid, Spain[2]**

The objective of this study was to analyze how different training aspects and biological factors in running affect the probability of suffering an injury and which muscles and joints are more susceptible to develop an injury. A total of 408 subjects, 206 cases and 202 controls, participated in the investigation. The inferior body was more prone to an injury, especially the muscles and tendons associated with the knee and the shank. Several characteristics of the runner and his/her training habits like the sex, age, experience, motivation and mileage have an impact on the injury risk. This information is very useful because biomechanists and coaches can design programs to improve the technique of the runners and reduce the risk of an injury.

**KEY WORDS:** injury risk, statistical analysis, epidemiology.

**INTRODUCTION:** Even though physical activity is associated with an improvement in life quality (Dias Lopes, Hespanhol Jr, Yeung, & Pena Costa, 2012) it is still associated with a risk of injury (Gabbe, Finch, Cameron, & Williamson, 2005).In Spain, physical activity has a big impact on the society. According to the Questionnaire on Sporting habits in Spain (*Encuesta de Hábitos Deportivos en España*) in the year 2010, close to 16 million people between the 15 and 75 years old practiced some kind of sport, representing 43% of the national population.

The impact that running injuries have in the athletes is high. Several studies in different groups of population establish that the rate of injuries oscillate between the 19% to the 79% and the injuries tend to be located in inferior body (Buist, Bredeweg, Lemmink, Mechelen, & Dierks, 2009). There is no consensus on which are the main risk factors for running injuries but several of them have been portrayed such as: excessive mileage, having sustained a previous injury, and the experience of the runner (Gent et al., 2007; Mechelen, 1992). Thus the objective of this study was to analyze which are the main risk factors in amateur runners and determine which parts of the body have a higher risk of injury.

**METHODS: Participants:** A total of 408 subjects were analyzed for this study. A descriptive and analytical epidemiological retrospective case-control study was undertaken. Participants were asked about the sports that they played and their previous injury history. 206 of the participants were included as cases if they were amateur runners, above 18 years old and had suffered an injury while running in the 12 months preceding the survey. An injury was defined as "*pain or discomfort that leads to a stop in the regular sports subject*". The other 202 participants were considered as controls who were amateur runners, above 18 years of age and had not suffered any injury in the 12 months preceding the interview. Data was

collected in Microdoft Excel® for review, and then exported to SPSS19.0 ®, from which the final analysis was performed.

The different variables included in the three sections detailed previously were evaluated. Absolute and relative frequencies, qualitative variables, and the mean and SD of the quantitative ones were calculated. Subsequently, the different variables classified by sex and age were described, and the results for cases (injured) and controls (non-injured) were detailed separately.

**Analytical study**: Prior to performing the analysis, qualitative variables were recorded into quantitative variables, in order to facilitate analysis. To test the strength of association between variables, contingency tables were performed using the Pearson chi-square statistic, applying the Yates correction. When the exact asymptotic p was ≤0.05, the difference was considered statistically significant. When it came to dichotomous variables, the risk measure was calculated. To minimize the effect of the sample size can have on the quantification of the chi square, contingency coefficient were used and Phi and Cramer's V. The established and adjusted standardized residuals, which are the best tool to accurately interpret the meaning of the detected association, were also calculated. Finally, the presence or absence of lesion was used as a dichotomous, dependent variable and a binary logistic regression analysis was performed on it, in the cases and the controls. The independent variables were gender, age, years of experience, mileage, motivation, duration of the session, anatomical placement of the injury and type of injury. The logistic regression coefficients were used to estimate the odds ratio (OR) of each of the independent variables.

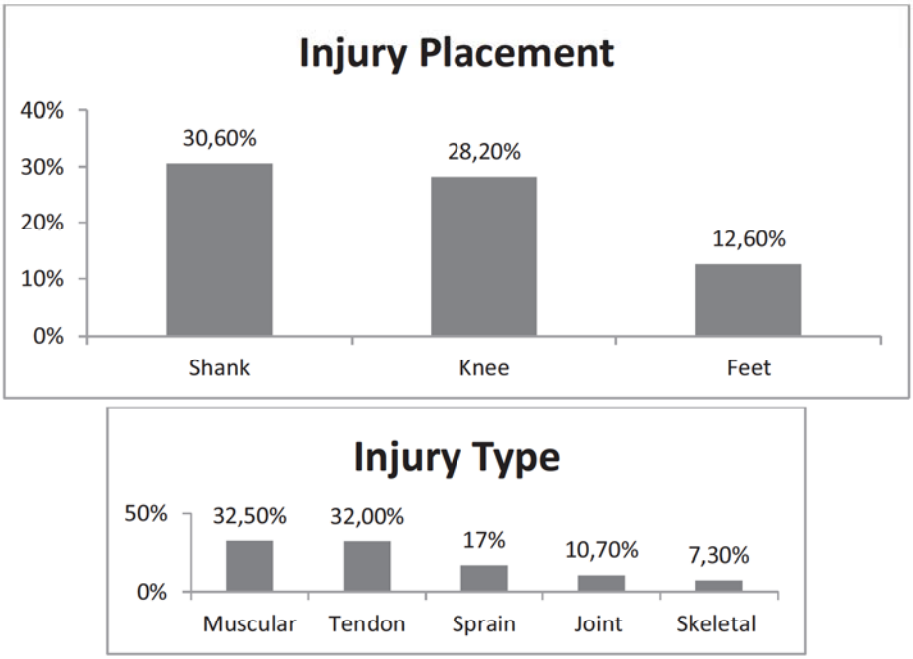
## RESULTS:

**Table 1. Characteristics of the participants**

| SEX | | AGE | |
|---|---|---|---|
| INJURED GROUP | HEALTHY GROUP | INJURED GROUP | HEALTHY GROUP |
| 87,9% MEN | 78,2% MEN | 58,9% >35 YEARS | 49,5% >35 YEARS |
| 12,1% WOMEN | 21,8% WOMEN | 41,1% <35 YEARS | 58,9% <35 YEARS |
| **MOTIVATION - MEN** | | **MOTIVATION - WOMEN** | |
| INJURED GROUP | HEALTHY GROUP | INJURED GROUP | HEALTHY GROUP |
| 27,1% TRAINING | 15,2% TRAINING | 24% TRAINING | 15,9% TRAINING |
| 17,7% COMPETE | 5,7% COMPETE | 16% COMPETE | 2,3% COMPETE |
| 55,2% RECREATIONAL | 79,1% RECREATIONAL | 60% RECREATIONAL | 81,8% RECREATIONAL |
| **DURATION OF TRAINING - MEN** | | **DURATION OF TRAINING - WOMEN** | |
| INJURED GROUP | HEALTHY GROUP | INJURED GROUP | HEALTHY GROUP |
| 57,5% > 1 HOUR | 46,2% >1 HOUR | 68% > 1 HOUR | 29,5% >1 HOUR |
| 42,5% < 1 HOUR | 53,8% <1 HOUR | 32% < 1 HOUR | 70,5% <1 HOUR |
| **MILEAGE - MEN** | | **MILEAGE - WOMEN** | |
| INJURED GROUP | HEALTHY GROUP | INJURED GROUP | HEALTHY GROUP |
| 40,8% >50 KM WEEK | 24,1% >50KM WEEK | 36% >50 KM WEEK | 9,1% >50KM WEEK |
| 59,2% <50 KM WEEK | 75,9% <50KM WEEK | 64% <50 KM WEEK | 90,9% <50KM WEEK |

| EXPERIENCE | |
|---|---|
| INJURED GROUP | HEALTHY GROUP |
| 59,7% > 5 YEARS | 42,6% > 5 YEARS |
| 40,3% <5 YEARS | 57,4% < 5 YEARS |

**Figure 1**
**Analysis of the injury location**







**DISCUSSION:** Injuries mainly occurred in the inferior body (Figure 1), being predominant in the shank and the knee. These injuries were either muscular or tendinous (Figure 1), with sprains being the third most common type of injuries and joint and skeletal injuries occurring with a lower frequency. This data was in accordance to results obtained in other studies (Chang, Shih, & Chen, 2012; Dias Lopes et al., 2012; Ellapen, Satyendra, Morris, & Heerden, 2013). Amateur runners must focus on improving the mechanics of muscles and tendons, especially those associated with the knee and shank. Working on something like knee impact in the stance phase could possibly reduce the risk of sustaining an injury. Training programs aimed at strengthening these muscles and tendons could also help.

Analyzing the main risks of running injuries similar results were obtained in almost all the variables. Training more than an hour was associated with a risk of injury 1.9 times ($p<0.05$) greater than training for a lesser time in one session. Running more than 50 km in one week had a 2.8 times greater risk ($p<0.05$) than running a lesser distance (Table 1). Training with a competitive objective had a greater risk of injury (5.5, $p<0.05$) than that with a recreational one (Table 1). All of these results were concurrent with previously published literature (Gent et al., 2007; Tyflidis, Kipreos, Tripolitsioti, & Stergioulas, 2012). From this data, a greater mileage appeared to be associated with a greater risk of injuries, runners and trainers must keep this in mind while designing training programs, and special attention must be paid to runners who run competitively. Other studies shows that the sex has a big repercussion in the risk of injury (Buist et al., 2009; Schneider, Weidmann, & Seither, 2007). Women had half

the risk of being injured (risk=0.5, p>0.05) than the men (risk = 1). Thus training programs must be different for men and women, and future biomechanical studies could investigate if the injury mechanism is different in men and women owing to the slightly different mechanics. But different results were obtained when it came to the experience (Fredericson & Mishra, 2007; Tyflidis et al., 2012): runners having more than 5 years of experience almost had double the risk of injury (risk=1.999 p<0.05) than those having lesser experience(Table 1). To the best of the authors' knowledge, no other studies that considered the age of the subject but it was assumed that in a non-contact sport like running the older the body gets, the more susceptible it is to injury, and the more the number of injuries one accumulates (Table 1).

**CONCLUSIONS:** With the information presented in this study, runners, trainers and biomechanists must concentrate training, strengthening and improving technique of the muscles and tendons associated with the shank and the knee. However, the training programs subsequently planned must consider the sex, age, experience, motivation and mileage of the runners as the injury risk differs between the different categories.

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