Determinants of the adoption of injury risk reduction programmes in athletics (track and field): an online survey of 7715 French athletes

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Original article

Determinants of the adoption of injury risk reduction programmes in athletics (track and field): an online survey of 7,715 French athletes

Running head: Determinants of injury risk reduction programmes adoption

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Funding: The authors have not declared a specific grant for this research from any funding agency in public, commercial or not-for-profit sectors. The present study was conducted in the context of the FULGUR project (ANR-19-STPH-003) funded by the French Research Agency in the perspective of the Paris 2024 Olympic and Paralympic Games in collaboration with French Federations of Athletics, Rugby and Ice Sports, Universities of Nantes, Côte d'Azur, Savoie Mont Blanc, Jean Monnet Saint-Etienne, Saclay, the Mines Saint-Etienne, the CEA and the CNRS. The University Jean Monnet Saint-Etienne and the French Institute of Sport (INSEP) are partners of the French-speaking network ReFORM. ReFORM, and the Amsterdam Collaboration on Health & Safety in Sports (ACHSS) are recognised as Research Centres for the Prevention of Injury and Illness the Protection of Athletes by the International Olympic Committee (IOC) and received funding from the IOC to establish a long-term research program on the prevention of injuries and illnesses in sports to protect athlete health.

Competing Interest: None declared. EV and PE are Associate Editors for the BJSM. EV is the Editor in Chief of BMJ Open Sports and Exercise Medicine. PE is Associate Editor for the

BMJ Open Sports and Exercise Medicine. PE is the Speciality Chief Editor for the Injury Prevention and Rehabilitation section of Frontiers in Sports and Active Living.

Ethics approval: The study was reviewed and approved by the Saint-Etienne University Hospital Ethical Committee (Institutional Review Board: IORG0007394, IRBN232020/CHUSTE).

Data availability statement: Data are available upon reasonable request. Please contact the corresponding author.

Contributorship statement: PE, MS, and AR conceived and designed the study and proposed the study protocol; SM, CH, LJ, and EV provided revisions on the study protocol. AR performed data analyses and drafted the manuscript. All co-authors contributed substantially to interpreting the results, provided important revisions, and approved the manuscript. All authors understand that they are accountable for all aspects of the work and ensure the accuracy or integrity of this manuscript.

Acknowledgements: The authors warmly thank the French Federation of Athletics (FFA, https://www.athle.fr) for sharing the questionnaire through their email lists and the athletes who participated in the study. The authors would like to thank Crane Rogers (Chaire ActiFS, Univ Lyon, UJM-Saint-Etienne, Laboratoire Interuniversitaire de Biologie de la Motricité, EA 7424, F-42023 Saint-Etienne, France) for his contribution to this project.

Supplementary data: The supplementary material contains: the material for measuring socio-cognitive determinants of injury risk reduction programmes adoption (i.e., the survey), and the tables displaying the means and standard deviations of socio-cognitive determinants for all categorical variables (i.e., athletes' characteristics).

Keywords: Sports injury prevention; prevention strategy adoption; theory of planned behaviour; socio-cognitive determinants; track and field; athletes.

Number of words (excluding title page, abstract, references, figures and tables): 3445 words

SUMMARY BOX

What are the new findings?

- Competing at the highest level, presenting a larger number of previous injuries, and sustaining the most-recent injury in the previous or current season increased the odds of adopting an injury risk reduction programme.
- Scores of the socio-cognitive determinants (i.e., attitudes, subjective norms, perceived behavioural control, and intentions) of injury risk reduction programme adoption were higher in athletes who adopted an injury risk reduction programme in the current season or sometime in their lifetime than those who didn't.
- Athletes who competed at the highest level, sustained a larger number of previous injuries, or the most-recent injury in the previous or current season, had higher scores of socio-cognitive determinants of injury risk reduction programme adoption.

How might it impact clinical practice in the near future?

While athlete characteristics (e.g. athletic discipline, level of competition, history of injuries) are difficult or even impossible to change, it is possible to influence the socio-cognitive determinants of their views on injury risk reduction programmes. Thus, a targeted approach on athletes' beliefs and intentions could increase the adoption of injury risk reduction programmes. Clinicians could increase the adoption of injury risk reduction programmes by educating athletes on the benefits of such programmes (i.e., improving attitudes), and how best to implement them into their daily life (i.e., increasing perceived behavioural control). The use of social media to visualise elite athletes performing such programmes (i.e., increasing subjective norms) could be an effective strategy to increase adoption.

ABSTRACT

Objectives To identify individual characteristics associated with the adoption of injury risk reduction programmes (IRRP) and to investigate the variations in socio-cognitive determinants (i.e., attitudes, subjective norms, perceived behavioural control, and intentions) of IRRP adoption in athletics (track and field) athletes.

Methods We conducted a cross-sectional study using an online survey sent to athletes licensed with the French Federation of Athletics to investigate their habits and socio-cognitive determinants of IRRP adoption. Sociodemographic characteristics, sports practice, and history of previous injuries was also recorded. Logistic regression analyses and group comparisons were performed.

Results The final sample was composed of 7,715 athletes. From the multivariable analysis, competing at the highest level was positively associated with IRRP adoption (AOR=1.66; 99.9%CI 1.39-1.99 and AOR=1.48; 99.9%CI 1.22-1.80) and presenting a low number of past injuries was negatively associated with IRRP adoption (AOR=0.48; 99.9%CI 0.35-0.65 and AOR=0.61; 99.9%CI 0.44-0.84), both during their lifetime and the current season, respectively. These results were supported by higher scores of socio-cognitive determinants among athletes who reported IRRP adoption compared to other athletes.

Conclusion Some characteristics of athletes seem to be associated with IRRP adoption either positively (competing at the highest level) or negatively (presenting a lower number of past injuries), whereas all the socio-cognitive determinants tested appear to be linked to IRRP adoption. Since many athlete characteristics are difficult or impossible to change, IRRP promotion may be enhanced by targeting athletes' beliefs and intentions to adopt an IRRP.

INTRODUCTION

Like other sports, participation in athletics (track and field) leads to injury risk.[1] Although to date there is little scientific evidence specifically on risk reduction strategies in athletics,[1–4] it seems important to implement effective injury risk reduction programmes (IRRP), as seen in other sports.[5–7] However, in athletics,[2,8] running,[9] and other sports,[10,11] studies investigating the effects of IRRP tend to show low compliance with suggested risk reduction interventions, limiting the impact of IRRP to those athletes who choose to adopt an IRRP. Hence, a better understanding of the beliefs and intentions of athletes who adopt or do not adopt an IRRP is likely to improve the implementation of IRRP. Specifically targeting athletes' behaviours may also improve compliance.[12,13]

The relevance of socio-cognitive theories of behaviour change has been highlighted by the work of Chan and Hagger.[14] One of the most studied socio-cognitive theories of behaviour change[15] is the theory of planned behaviour.[16] It posits that behavioural beliefs (attitudes, subjective norms, and perceived control) predict the intention to perform certain behaviours, which then predicts a change in these behaviours.[16] In the theory of planned behaviour, attitudes are defined as overall evaluations of behaviour by an individual; subjective norms as beliefs about what significant others may think of an individual's behaviour adoption; perceived behavioural control as the individual's perception of the extent of control over behaviour adoption, and intentions as conscious plans, decisions or self-instructions to exert effort towards adopting a behaviour. Such behavioural beliefs and intentions from the theory of planned behaviour are identified as socio-cognitive determinants of behaviour adoption. Previous studies on IRRP adoption assumed that the theory of planned behaviour could be used as part of a framework to better understand the athlete's compliance with their IRRP.[14,17,18]

The individual perceptions of IRRP and injuries using qualitative research design was previously investigated in athletes in a study.[19] Although this study included a small number of participants, the results suggested that athletes emphasise beliefs such as attitudes (e.g., injury prevention is less important than performance), subjective norms (e.g., communication with physiotherapists and coaches is necessary), and perceived control (e.g., injury prevention is part of training).[19] Additionally, Bolling et al.[19] showed that other factors such as previous injuries or years of sport experience might determine IRRP adoption. However, studies based on larger samples and using behaviour change theories as background are very rare in the context of IRRP adoption. To our knowledge, only Chan and Hagger[17] were able to investigate the socio-cognitive determinants of IRRP adoption in elite athletes. Their results were based on the self-determination theory,[20] which is a theory of motivation (i.e., the reason why adopting an IRRP), and not on the theory of planned behaviour (i.e., the beliefs regarding IRRP adoption, and intentions to adopt an IRRP).[17]

In this context, the present study aimed to 1) identify individual athletes' characteristics associated with IRRP adoption and 2) investigate the variations in socio-cognitive determinants of IRRP adoption among athletics athletes using the theory of planned behaviour as theoretical background. We hypothesised that some athletes' characteristics and socio-cognitive determinants are associated with IRRP adoption.

METHODS

Study design and procedure

We conducted a cross-sectional study through a one-time online survey. We asked athletics athletes licensed at the French Federation of Athletics (FFA, http://www.athle.fr) on their habits, motives, beliefs, and intentions to adopt an IRRP. There was no athlete, patient and public involvement in the development of the study questions or conduction of the survey.

The study was reviewed and approved by the Saint-Etienne University Hospital Ethical Committee (Institutional Review Board: (Institutional Review Board: IORG0007394, IRBN232020/CHUSTE).

Population

The eligible population was comprised of athletes licensed at the FFA with the following inclusion criteria: aged 18 years or older, licensed as competing athletes, and legally able to provide consent to participate in the present study.

Data collection

The survey was developed by one researcher experienced in sports psychology (AR), two sports medicine physicians (PE and MS), one researcher experienced in sports scientist (EV), one athletics coach (SM) and one psychologist (LJ). After two review rounds, all co-authors approved the survey which was then pilot-tested on three competitive athletes in February 2020. All co-authors performed the final validation of the survey.

The online survey was composed of four parts: *i)* information on the athletes (age, sex, athletics discipline,[21] number years of athletics practice experience, and competition level), *ii)* adoption of an IRRP during the entire career named "lifetime" and during the current season (with options: "yes entirely", "yes partially", "not at all"), *iii)* information on injuries (lifetime number, time since the most-recent injury, location (following the classification used by Edouard et al.[22]) and cause (traumatic or overuse) of the most-recent injury and time loss after the most-recent injury[21]), and *iv)* socio-cognitive determinants of behaviour adoption from the theory of planned behaviour for IRRP adoption (attitudes, subjective norms, perceived behavioural control, and intentions[16]). The survey is presented in supplementary data.

An IRRP was defined in the survey as a set of specific exercises related to his/her sport which aims to reduce the risk of injury, including, for example, muscle strengthening, stretching, or balance exercises. An injury was defined as pain, discomfort, or damage to the musculoskeletal system, occurring during sports practice (training or competition), and having resulted in consequences on sports practice (reduction in practice, adaptation or incomplete practice, or discontinuation of the practice), regardless of consultation by a health professional.[2] These definitions were provided to the athletes in the survey (supplementary data file).

Items measuring the socio-cognitive determinants of the theory of planned behaviour were created following Ajzen's guidelines.[16] The four socio-cognitive determinants (attitudes, subjective norms, perceived behavioural control, and intentions) were measured with four items each, rated on 7-point Likert scales.[16] Individual scores ranged from 1 (lowest possible score) to 7 (highest possible score). The items are available in supplementary data. A confirmatory factor analysis was performed using the R package *lavaan*[23] to check the factor structure of the created material. The comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root-mean-square error of approximation (RMSEA) were used to estimate the goodness-of-fit statistics[24,25] and revealed an acceptable fit of the factor structure to the data.

The invitation to the survey was distributed via an email sent by the FFA to the registered email address of licensed competing athletes on April 22nd 2020. The survey was closed on May 7th 2020, after 15 days, without any reminder after the initial invitation.

Statistical analyses

Statistical analyses were conducted using R (version 4.0.2, © Copyright 2020 The Foundation for Statistical Computing (Comprehensive R Archive Network, http://www.R-project.org)). In order to limit the risk of Type I errors and given the large size of our sample, the α (i.e.,

significance level) was set at 0.001 for statistical analyses;[26] *p*-values were set at 0.001 and confidence intervals (CI) were set at 99.9%. We first performed a descriptive analysis of the collected data, using frequency with percentages for categorical variables, and median and range for continuous variables describing the sample (i.e., age and years of experience in the athlete's main discipline).

Based on the descriptive analysis, several categorical variables were merged to improve the power of logistic regression analyses. For IRRP adoption, "yes entirely" and "yes partially" were combined as "yes", and "not at all" was considered "no"; this choice was made pragmatically to make "IRRP adoption" become a binary outcome variable for logistic regression analyses. For discipline practice, we categorized as "explosive" the following disciplines: "sprints", "jumps", "throws", "hurdles", and "combined events"; and as "endurance": "middle and long distances", "marathon", "race walking", "road running", and "trail and mountain running") as previously performed.[27] From the 4 competition level categories, we combined "international" and "national" as one category and "regional" and "departmental" as another. For lifetime number of injuries, categories from "none" to "3" were considered as separate categories, categories of "4" and "5" were combined as "4 or 5", and categories of "6" to "10 or more" were combined as "more than 5"; for time since the most-recent injury "current season" and "6 months to 5 years" were considered as separate categories, and "5 to 10 years" and "more than 10 years" were combined as "more than 5 years". For time loss after the most-recent injury, "1 to 7 days" and "8 to 28 days" were combined as "minor to moderate", and "29 days to 6 months" and "more than 6 months" were combined as "severe" , this reduced the usual classification of the severity of injuries[21] to two categories.

We used binomial logistic regressions to analyse the potential associations between IRRP adoption (lifetime and current season) and individual characteristics (sex, age, sport practised,

years of discipline practice experience, competition level, lifetime number of injuries, time since the most-recent injury, and time loss after the most-recent injury), providing odds ratios (OR) and 99.9% confidence intervals (99.9% CI) in univariate and multivariable models. We then used multivariable models to calculate adjusted OR (AOR) by including all athletes' characteristics as covariates. OR above 1 indicates a tendency for the reference group to adopt IRRP more than the other groups, and OR below 1 indicates a tendency for the reference group to adopt IRRP less than the other groups.

For the comparison of socio-cognitive determinants of IRRP adoption between groups (i.e., those who adopted an IRRP *versus* those who did not), based on Shapiro-Wilk and Bartlett tests of normality and homogeneity in variances, parametric group comparisons were performed using the Student t-test, as well as analyses of variances (ANOVA) with Tukey post-hoc tests.

RESULTS

Population

From a list of 75,575 competitive licensed athletes, a total of 8,809 athletes replied to the invitation to participate in this study between April 22nd 2020 and May 7th 2020, among which 7,715 athletes (10.2%) met inclusion criteria, gave their informed consent to participate in the present study, and were included in the analysis. The characteristics of the final sample are displayed in table 1.

IRRP adoption

A total of 5,430 (70.4%) athletes declared they never adopted an IRRP during their entire athletics career, 1,705 (22.1%) declared having partially adopted an IRRP, and 580 (7.5%) declared having already performed an IRRP during their lifetime. Additionally, 5,929 (76.9%)

athletes were not adopting any IRRP during the current season, 1,282 (16.6%) were partially adopting an IRRP during the current season, and 504 (6.5%) declared having performed an IRRP during the current season (table 1).

IRRP adoption as a function of athletes' characteristics

Univariate logistic regression models showed that athletes practising endurance disciplines were less likely to adopt an IRRP during their lifetime (OR = 0.72; 99.9%CI 0.60 to 0.87), and that athletes competing at a higher level were more likely to adopt an IRRP both during their lifetime (OR = 1.82; 99.9%CI 1.53 to 2.15) and during the current season (OR = 1.55; 99.9%CI 1.29 to 1.86) (table 2).

However, when adjusting the models for all athletes' characteristics (i.e., multivariable models), the results showed that only the association between IRRP adoption and competition level remains significant (table 2).

Results of the associations between IRRP adoption and history of injuries, both in current season and during their lifetimes, showed that athletes with no history of an injury were less likely to adopt an IRRP than those who sustained 3 or more injuries (table 2). These associations remained significant for athletes who sustained the most injuries (4 or more) in multivariable models adjusting for all athletes' characteristics (table 2).

The results of univariate logistic regression analyses also showed that individuals who sustained an injury more than five years before their participation in this study were less likely to adopt an IRRP during the current season (OR = 0.62; 99.9%CI 0.48 to 0.81) than those who sustained an injury during the current season. However, there seem to be no significant association between IRRP adoption and the severity or cause (overuse *versus* traumatic) of the most-recent injury (table 2).

Socio-cognitive determinants of IRRP adoption

Regarding the socio-cognitive determinants of IRRP adoption, the 7,715 athletes participating in the present study showed mean scores above the theoretical median of 4 (possible scores ranged from 1 to 7) for attitudes (5.54 ± 1.21) and perceived behavioural control (5.45 ± 1.30), and near the theoretical median for subjective norms (4.17 ± 1.26) and intentions (4.69 ± 1.69).

The comparisons between athletes who reported having adopted an IRRP during their lifetime or current season and those who did not showed that for all socio-cognitive determinants (i.e., attitudes, subjective norms, perceived behavioural control, and intentions), athletes who declared they adopted an IRRP scored higher than athletes who declared they didn't (for both lifetime and current season) (table 3).

Variations in socio-cognitive determinants across athletes' characteristics

Women displayed significantly higher scores for attitudes and significantly lower scores for perceived behavioural control than men. Athletes practising disciplines categorised as "explosive" showed significantly higher scores of attitudes and subjective norms than those practising "endurance". Athletes competing at the highest levels displayed significantly higher scores for subjective norms, perceived behavioural control and intentions of IRRP adoption than those competing at the regional or departmental level. More detailed descriptions of the socio-cognitive determinant variables can be found in the supplementary data.

Scores of socio-cognitive determinants of IRRP adoption significantly increased with the lifetime number of injuries: the more the injuries, the higher the scores. Additionally, a similar tendency was observed for the time since the most-recent injury occurred: the more recent the injury, the higher the scores of socio-cognitive determinants of IRRP adoption. Furthermore, athletes with the most-recent injury categorised as "severe" showed significantly higher

scores of intentions to adopt an IRRP than those with a "minor to moderate" most-recent injury. However, no difference was found between overuse and traumatic injuries (see supplementary material).

DISCUSSION

The main findings of the present study were that competing at the highest level, presenting a larger number of past injuries, and sustaining a most-recent injury during the last or current season were positively associated with IRRP adoption. Higher scores of socio-cognitive determinants supported adopting an IRRP in these categories of athletes. Additionally, athletes who adopted an IRRP during their career or the current season showed higher scores of socio-cognitive determinants than those who did not.

Another important finding of the present study is that, in our sample of 7,715 adult athletics athletes, more than two-thirds (70%) had never adopted an IRRP and less than a quarter (22%) had only partially performed an IRRP during their lifetime. Hence, only 7.5% of the study athletes had already completely performed an IRRP during their lifetime. These results suggest that there is a need for further work to increase adoption of injury risk reduction strategies in athletics.

Higher level and number of previous injuries associated with higher IRRP adoption

The main characteristics associated with IRRP adoption in multivariable models were a higher level of competition and a higher number of past injuries. These results are in line with previous investigations on the perception of injury prevention in elite athletes. Athletes perceive injury prevention as a learning process that comes with experience, higher training loads, and past injuries.[19] However, the current challenge in injury prevention may be to generalise efforts among non-elite athletes who have not sustained more than one or two

injuries during their careers. Additionally, the current study showed that elite athletes presented higher scores of subjective norms, perceived behavioural control, and intention regarding IRRP adoption, as well as the same tendency for athletes who sustained more injuries, hence increasing their likelihood to adopt an IRRP. For these athletes, the promotion and delivery of IRRP may benefit from evidence-based practice in the domain of behaviour change, such as intervention mapping approaches.[28]

Taking into account the context to enhance IRRP implementation

Bolling et al.[29] suggested revising the "sequence of prevention" of sports injuries and highlighted the importance of considering the context to provide better grounds for injury prevention. What athletes (a) think of IRRP (i.e., attitudes), what they (b) think their coaches, medical staff, teammates, friends, and family think of IRRP (i.e., subjective norms), (c) how autonomous they are regarding IRRP adoption (i.e., perceived behavioural control), and (d) how much they intend to adopt an IRRP (i.e., intentions) are core contextual determinants of their perceptions of injury and injury prevention. Thus, the methods used to promote injury prevention, and improve athletes' adoption of IRRP, should consider socio-cognitive determinants as levers to help athletes change their behaviours.

Kok et al.[28] posited that there are three parameters to consider for improving the effectiveness of a method that targets a change in behaviours: "(a) it must target a determinant that predicts behaviour; (b) it must be able to change that determinant; (c) it must be translated into a practical application in a way that preserves the parameters for effectiveness and fits with the target population, culture, and context". Respecting these parameters when promoting IRRP among athletes may increase the chances of achieving higher adherence and compliance rates, and thus, the efficacy of IRRP. For example, perceived behavioural control has been shown to be associated with IRRP adoption in our sample of French athletes. Hence, to increase the

perceived behavioural control (i.e., determinant) of athletes who have never adopted an IRRP because they think they are not in control of such exercises, visualising themselves successfully performing IRRP exercises may be an effective strategy (see Conroy and Hagger[30] for an example in health psychology). Most athletes are familiar with using mental imagery (i.e., visualisation) as a tool for mental skill training, so this could easily translate to imagining themselves performing exercises from the IRRP.

Limitations

One limitation of the present study is that we focussed solely on the socio-cognitive determinants of adopting an IRRP and not the perception of the consequences of adopting an IRRP. As highlighted in the reasoned action approach,[31] the perceived effects of adopting a behaviour is an important determinant. Previous qualitative research has shown that the perception of an injury may impact athletes' decisions on their training content.[32] Hence, further investigations may be needed and should consider the reasoned action approach (i.e., an extended version of the theory of planned behaviour) as a framework for investigating the determinants of IRRP adoption in athletes. Another limitation could be recruitment bias. Indeed, it is possible that athletes who agree with or who have performed IRRP responded preferentially to the survey, and thus could be over-represented compared to the general population of FFA licensed athletes. In addition, although we defined IRRP, no details regarding different IRRP practices and experiences were collected from participating athletes. Among athletes who reported IRRP adoption, understanding and/or experiences of IRRP could differ and thus influence the results.

Additionally, the retrospective design of the present study does not make it possible to conclude that the differences in socio-cognitive determinants (measured as beliefs regarding IRRP adoption at the time of the survey) explain the differences in IRRP adoption during

previous seasons or throughout athletes' careers. In order to be able to estimate the associations between socio-cognitive determinants and changes in IRRP adoption, a prospective study design is recommended. However, estimating the differences in socio-cognitive determinants across groups of individuals who (1) adopt and (2) do not adopt a behaviour is the recommended method for identifying the most relevant determinants to target a behaviour change intervention, as suggested by Crutzen, Peters and Noijen.[33] Finally, it was not possible to conduct an analysis of non-responders to determine how well the study sample represented the 75,575 eligible athletes.

Perspectives

As described by Bolling et al.,[29] "the study of any health behaviour in isolation from the broader social and environmental context is incomplete" and will lead to implementation issues. Therefore, further research is encouraged to embrace an ecological perspective of injury prevention by investigating multilevel, contextual, and socioecological factors of IRRP adoption. A first step in this direction would be to replicate the present study with multiple stakeholders who are relevant for effective implementation of intervention measures, such as athletics coaches, as stipulated by O'Brien and Finch.[34]

Given the limited number of athletes who have already performed an IRRP during their lifetime, there is a clear need to improve implementation and adoption of IRRP in order to improve injury risk reduction in athletics. The results of the present study could serve to promote IRRP in athletes. In fact, targeting attitudes, subjective norms, and perceived behavioural control in the material of IRRP promotion campaigns could increase IRRP adoption. This could also be achieved via education programs for athletes and information dissemination.

CONCLUSIONS

Athletes' characteristics seem to be associated with IRRP adoption and socio-cognitive determinants of IRRP adoption. As athletes' characteristics are difficult or even impossible to change, the promotion of IRRP may benefit from targeting athletes' beliefs and intentions to adopt an IRRP.

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TABLES

Table 1 Characteristics of the 7,715 athletics (track and field) athletes included in the present study.

Variables	**Number (%)**	**Median (range)**
Age (years)		38 (18-87)
Sex		
Men	4,842 (62.8 %)	
Women	2,873 (37.2 %)	
Main sport practice		
Sprints	824 (10.9 %)	
Hurdles	232 (3.0%)	
Jumps	416 (5.4 %)	
Throws	293 (3.8 %)	
Combined events	153 (2.0 %)	
Middle and long distances	1,549 (20.1 %)	
Marathon (incl. semi)	1,069 (14.0 %)	
Race walking	215 (2.8 %)	
Road running	1,871 (24.3 %)	
Trail and mountain running	1,093 (14.2 %)	
Discipline practice experience (years)		7 (1-63)
Competition level		
International	450 (5.8 %)	
National	2,209 (28.6 %)	
Regional	3,136 (40.6 %)	
Departmental	1,920 (24.9 %)	
Lifetime adoption of IRRP		
Yes, entirely	580 (7.5 %)	
Yes, partially	1,705 (22.1 %)	
Not at all	5,430 (70.4 %)	
Current season's adoption of IRRP		
Yes, entirely	504 (6.5 %)	
Yes, partially	1,282 (16.6 %)	
Not at all	5,929 (76.9 %)	
Lifetime number of injuries		
None	772 (10.0 %)	
1	1,436 (18.6 %)	
2	1,672 (21.7 %)	
3	1,246 (16.2 %)	
4	727 (9.4 %)	
5	606 (7.9 %)	
6	275 (3.6 %)	
7	124 (1.6 %)	
8	104 (1.3 %)	
9	41 (0.5 %)	
10 or more	712 (9.2 %)	
Time since most-recent injury (n = 6,943)		
Less than 6 months (current season)	2,603 (37.5 %)	
6 months to 5 years	3,619 (52.1 %)	
5 to 10 years	479 (6.9 %)	

More than 10 years	242 (3.5 %)	
Location of the most-recent injury (n = 6,943)		
Head and neck	8 (0.1 %)	
Upper limb	157 (2.3 %)	
Trunk	283 (4.1 %)	
Hip/groin	583 (8.4 %)	
Thigh	1,091 (15.7 %)	
Knee	1,357 (19.5 %)	
Lower leg	1,158 (16.7 %)	
Achilles tendon	810 (11.7 %)	
Ankle	806 (11.6 %)	
Foot	690 (9.9 %)	
Time loss after the most-recent injury (n = 6943)		
Continued to practice as usual	373 (5.4 %)	
1 to 7 days	680 (9.8 %)	
8 to 28 days	2,435 (35.1 %)	
29 days to 6 months	2,696 (38.8 %)	
More than 6 months	759 (10.9 %)	
Cause of the most-recent injury (n = 6943)		
Traumatic	3,278 (47.2 %)	
Overuse	3,665 (52.8 %)	

1 IRRP: Injury risk reduction programme.

Table 2 Associations between athletes' characteristics and injury risk reduction programmes (IRRP) adoption during lifetime and during the current season using the binomial logistic regression.

	Lifetime IRRP adoption				**Current season's IRRP adoption**			
	Univariate model		**Adjusted for all factors**		**Univariate model**		**Adjusted for all factors**	
	OR	*99.9% CI*	*AOR*	*99.9% CI*	*OR*	*99.9% CI*	*AOR*	*99.9% CI*
Sex (reference female athletes)	0.88	0.78-1.10	0.88	0.73-1.07	0.90	0.74-1.08	0.89	0.73-1.09
Age (years)	1.01	1.00-1.02	1.02	1.00-1.02	1.01	1.00-1.01	1.01	1.00-1.02
Main discipline (reference endurance)	**0.72**	**0.60-0.87**	0.91	0.73-1.13	0.87	0.71-1.06	1.02	0.81-1.30
Discipline practice experience (years)	0.99	0.98-1.00	0.98	0.97-1.00	0.99	0.98-1.00	0.99	0.98-1.00
Competitive level (reference international or national)	**1.82**	**1.53-2.15**	**1.66**	**1.39-1.99**	**1.55**	**1.29-1.86**	**1.48**	**1.22-1.80**
Lifetime number of injuries (reference no injuries)								
1	1.06	0.75-1.50	used as reference		0.84	0.56-1.23	used as reference	
2	0.91	0.65-1.26	0.85	0.72-1.00	0.76	0.52-1.10	0.93	0.69-1.26
3	**0.70**	**0.50-0.99**	0.67	0.64-1.12	**0.61**	**0.41-0.89**	0.78	0.57-1.07
4 or 5	**0.59**	**0.42-0.82**	**0.57**	**0.50-0.91**	**0.54**	**0.36-0.78**	**0.70**	**0.51-0.95**
More than 5	**0.49**	**0.35-0.69**	**0.48**	**0.35-0.65**	**0.45**	**0.31-0.66**	**0.61**	**0.44-0.84**
Time since most-recent injury (reference more than 5 years since the most-recent injury)								
Last 5 seasons	0.87	0.69-1.09	1.15	0.85-1.56	**0.73**	**0.57-0.95**	0.87	0.61-1.22
Current season	0.92	0.72-1.16	1.40	1.00-1.95	**0.62**	**0.48-0.81**	0.80	0.55-1.14
Time loss after most-recent injury (reference minor to moderate (< 28 days))	1.00	0.84-1.19	1.03	0.86-1.23	0.97	0.80-1.16	0.96	0.79-1.16
Cause of most-recent injury (reference traumatic)	1.03	0.87-1.23	0.97	0.81-1.16	0.95	0.79-1.14	0.93	0.77-1.13

Note: OR: odds ratio. CI: confidence interval. AOR: adjusted odds ratio (adjusted for all variables). Bold values are for significant OR (when 1 is not included in the 99.9%CI). OR above 1 means a tendency for the reference group to adopt IRRP more than the other groups, and OR below 1 means a tendency for the reference group to adopt IRRP less than the other groups.

Table 3 Variations in socio-cognitive determinants by injury risk reduction programmes (IRRP) adoption.

	Lifetime IRRP adoption			**Current season IRRP adoption**		
	Yes (n = 2,285)	**No** (n = 5,430)	*p*	**Yes** (n = 1,786)	**No** (n = 5,929)	*p*
Attitudes	5.88 ± 1.03	5.40 ± 1.25	*	5.97 ± 0.99	5.41 ± 1.24	*
Subjective norms	4.74 ± 1.17	3.93 ± 1.22	*	4.89 ± 1.12	3.95 ± 1.22	*
Perceived behavioural control	5.94 ± 1.07	5.24 ± 1.33	*	6.06 ± 1.00	5.26 ± 1.32	*
Intentions	5.61 ± 1.39	4.30 ± 1.65	*	5.91 ± 1.21	4.32 ± 1.64	*

Note: Values are expressed as mean (M) ± standard deviation (SD). *$p < 0.001$.