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Educating and promoting athletes' health protection through infographics on injury and illness prevention during an international competition: a prospective study during the 2024 European Athletics Championships

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ABSTRACT

Objective To investigate the feasibility, perceived relevance and usefulness of providing injury and illness prevention information through infographics to athletes and medical teams before and during an international athletics championship, and its potential impact on injury and illness risk during the same championship.

Methods We conducted a prospective cohort study during the 2024 European Athletics Championships in Roma with (1) dissemination of infographics, (2) data collection on perceived relevance (yes/no) and perceived usefulness (score from 0 to 100) of infographics among athletes and medical teams using an online questionnaire and (3) data collection by medical teams of newly incurred injuries and illnesses among athletes during the championship.

Results Among the 124 athletes who completed the questionnaire, 35.5% had access to the infographics, of which 86.4% found the information relevant, and their perceived usefulness scores to reduce their risk were 51.8±23.9 (range: 2.9–100.0) for injuries and 50.6±23.0 (range: 0.0–100.0) for illnesses. Among the registered physicians and physiotherapists, 44 replied to the survey, 70.5% had access to the infographics, of which 83.9% found it relevant, and their perceived usefulness scores to reduce risk were 55.6±28.0 (range: 6.0–100.0) for injuries and 52.9±28.0 (range: 0.0–100.0) for illnesses. The logistic regression showed that a higher perceived usefulness score was associated with a lower risk of in-championship injury (OR 0.950; 95% CI 0.877 to 0.996).

Conclusions Promoting the health protection of athletes through infographics on injury and illness prevention in the context of international athletics championships was feasible and may represent an additional prevention approach.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Previous studies have reported around 100 injuries and 40 illnesses per 1000 registered athletes during international athletics championships, with differences between female and male athletes and according to the disciplines.

⇒ During international athletics championships, about 30% of athletes reported suffering from an injury complaint and 20% an illness complaint during the 4 weeks before the championships.

⇒ Educating athletes and their entourage (eg, coaches, medical teams and team leaders) and promoting health protection through information on injury and illness prevention could represent an opportunity in the specific context of international athletics championships.

INTRODUCTION

During international athletics championships, the high risk of sustaining an injury or illness and the consequences on their health and performance[1–5] justifies the need to continue developing and implementing injury and illness prevention strategies.[6] Several injury and illness prevention strategies have been reported in the literature with different levels of scientific evidence, including, for instance, neuromuscular exercises, technical optimisation, education, promoting a healthy lifestyle (sleep, hand washing, hydration, nutrition), limiting contacts, psychology, medical organisations, federal policies.[6]

Among these prevention strategies, education (ie, the process of teaching and learning as well as informing someone about something[7]) is viewed as an opportunity for athletes and their entourage (eg, coaches, medical teams, team leaders).[8–10] Indeed, some studies on athletes reported an insufficient level of health literacy[11–14] (ie, the degree to which individuals can obtain, process and understand the basic health information and services they need to

WHAT THIS STUDY ADDS

⇒ Infographics may potentially disseminate information about injury and illness prevention to athletes and their teams before and during an international athletics championship.
⇒ Due to the several communication methods, one-third of athletes and two-thirds of team physicians and physiotherapists had access to this information.
⇒ More than 80% of athletes and medical teams who completed the questionnaire and had access to the infographics found the information relevant.
⇒ The usefulness of reducing injury and illness reported by athletes and medical teams varied extremely, from no help to maximum help.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Promoting athletes' health protection and educating athletes and their teams using infographics for injury and illness prevention in international athletics championships was feasible.
⇒ The low proportion of athletes and medical teams accessing the information highlighted the need to improve the dissemination of the information.
⇒ The wide range in the perceived usefulness highlighted the potential need to tailor this approach to individual needs.
⇒ The present study's findings support the interest in continuing such an injury and illness prevention approach.

make appropriate health decisions[15]). Thus, providing educational content could help athletes better manage their health, injury and illness risks. A recent cluster randomised controlled trial conducted on young athletes reported the efficacy of a digital health platform with athletics-specific training and health information to reduce injury risk.[16] Such educational content could also be of interest to medical teams to remind them about these concepts or to help them update their knowledge, but also with the aim that medical teams share this information with the athletes. In addition, promoting (ie, encouraging people to like, buy, use, do or support something[7]) health protection through practical tips, general health messages and recommendations on athletes' health protection could be an additional approach to education. Such a promotion could be done directly to the athletes and also through the medical teams. In the context of international athletics championships, educating and promoting health protection through information on injury and illness prevention seems appropriate.Compared with other injury and illness prevention strategies, education and promotion may not (or less) interfere with the athlete's practice and could be effective in the short term.

In this context, we aimed to investigate the feasibility, perceived relevance and usefulness of providing injury and illness prevention information through infographics to athletes and medical teams before and during an international athletics championship and its potential impact on injury and illness risks during the same championship.

METHODS

Study design and overall procedure

We conducted a prospective cohort study with (1) dissemination of information on injury and illness prevention through infographics, (2) data collection of perceived relevance and perceived usefulness of the infographics in medical teams using an online questionnaire, (3) data collection of perceived relevance and perceived usefulness of the infographics in registered athletes, associated with the data collection of potential self-reported injury and illness complaints during the 4 weeks preceding the championships, using an online Preparticipation Health Questionnaire (PPHQ)[2 17] and (4) data collection of newly incurred in-championship injuries and illnesses in registered athletes by medical teams,[1–3] at the 2024 European Athletics championships in Roma.

Equity, diversity and inclusion statement

All athletes registered at the 2024 European Athletics championships in Roma were eligible for this study without restriction based on sex, race/ethnicity/culture, socioeconomic level or representation from marginalised groups.

The author team included two junior and four senior researchers from various disciplines (sports medicine, physical medicine and rehabilitation, sports sciences and data sciences) and four European countries (France, Germany, Greece and Portugal).

Population

The targeted population included (1) all female and male athletes and (2) medical team members registered at the 2024 European Athletics championships in Roma. There were no exclusion criteria.

Information on injury and illness prevention

To educate and promote health, we created infographics to provide information on injury and illness prevention based on previous studies on injury and illness during international athletics championships, especially during European championships.[1–3 18–22] The content of the infographics was extracted from previously published and peer-reviewed scientific articles to provide information with the highest level of scientific evidence.[1–3 18–22] The infographics presented the results of the previously published studies (eg, a summary of the main results, figures) or the practical implications suggested by the authors based on the results of these studies. The infographics were designed to be as clear as possible and accessible to the targeted audience (athletes and medical teams), as well as to be useful by including practical tips. We created 20 infographics covering three domains: (1) the main injuries and illnesses occurring before and during international athletics championships, (2) the main injury and illness risk factors and (3) practical proposals for injury and illness prevention. The infographics are available in online supplemental material.

Different strategies were used to disseminate the infographics. First, 2 months before the 2024 European Athletics championships in Roma, information regarding the present study and a web link and QR code to access the infographics were (1) included in the team manual sent to the member federations by the European Athletics, which had to disseminate it to their European championship participants and (2) sent through email to the national medical teams, which were asked to forward to athletes, coaches and team leaders of their team, with three reminders. Second, during the 2024 European Athletics championships in Roma, infographics were displayed in the venues used by athletes and medical teams (eg, warm-up area, hotel and medical centres). Through emails, medical teams and team leaders were informed again about the present study and the infographics. Third, three research team members (PE, SI and P-ED) were also present at the different venues and regularly reminded medical teams and team leaders about the infographics.

Injury and illness definitions and data collection procedure

We used the same injury and illness definitions and data collection procedure as in previous injury and illness surveillance studies during athletics international championships[1–3] to allow comparisons between studies. In addition, these definitions were very close to those provided in the International Olympic Committee consensus statement for methods for recording and reporting epidemiological data on injury and illness in sports 2020.[23] Detailed information on definitions of injury and illness is supplied in online supplemental material.

Two months before the championships, the research team informed the local organising committee (LOC) physicians and the national medical teams by email about the study, and European Athletics contacted national federations by email so that they would inform registered athletes.

At the start of the Championships, the study aim and procedure were again explained to the LOC physicians and the national medical teams during a medical meeting and regularly reminded by research team members. In addition, registered athletes were informed about the present study. They were asked to complete the PPHQ by (1) posters displayed on the different venues of the championships (hotels, restaurants, medical centres, training and warm-up areas), (2) emails sent by their national federations, (3) research team members at the different venues during the whole period of the championships and informing the athletes about the present study, to raise interest in the study and how to participate in it.[17]

During the period of the championships, athletes were invited to complete the PPHQ on personal and training characteristics (sex, age, country, height, weight, discipline and time spent in training) and injury and illness complaints during the 4 weeks preceding the championships.[2 17 24–26] Additional questions were added regarding the information on injury and illness prevention if athletes had access to this information (yes/no), and if so, if they found the information relevant for their practice (yes/no) (corresponding to the perceived relevance) and in what extent they think this may help to reduce their risk of injury and illness (scale from 0 to 100) during the championships (corresponding to the perceived usefulness). The PPHQ was available online in English using a website application through a QR code (IPrevApp, https://iprevapp.emse.fr). Athletes were asked to complete the questionnaire themselves or, if needed, seek the help of team physicians or the research team at the venues. More information on the PPHQ is available in previous articles,[2 17] and the PPHQ is available in online supplemental material.

During the period of the championships, the LOC physicians and the national medical teams were asked to report all newly occurring injuries and illnesses daily using a secured online-based web application (IPrevApp, https://iprevapp.emse.fr).[17] National medical team participation, athletes' coverage and response rate were reported, according to Edouard *et al*.[27] (details in online supplemental material). At the end of the championships, through an online survey, we also asked the national medical teams if they had access to the information on injury and illness prevention (yes/no), and if so, if they found the information relevant for their practice (yes/no) (ie, perceived relevance), and in what extent they think this has helped to reduce the risk of injury and illness in their team (scale from 0 to 100) (ie, perceived usefulness).

Statistical analyses

We performed descriptive analyses using frequency and percentages for categorical variables and means and SD for continuous variables. We also calculated prevalence (with 95% CIs) for injury and illness complaints, and in-championship injury and illness incidence rates as the number of in-championship injuries or illnesses per 1000 registered athletes.

To analyse the potential impact of the information on the injury and illness risks during the same championship, we first performed a descriptive analysis by presenting the in-championship injury and illness incidence rates according to access to the infographics, perceived relevance and perceived usefulness. We also performed binomial logistic regressions with (1) access to the infographics (yes/no), (2) perceived relevance (yes/no) and (3) perceived usefulness score as the independent variables and with (a) in-championship injury (yes/no) and (b) in-championship illness (yes/no) as the dependent variables. Regression analyses were adjusted for sex, age, main discipline, preparticipation injury complaint (yes/no) and preparticipation illness complaint (yes/no) as in Edouard *et al*.[2] ORs and 95% CIs were calculated.

Analyses were performed using Excel (Office, Microsoft, 2021) and R (V.4.0.2, Copyright 2020 The

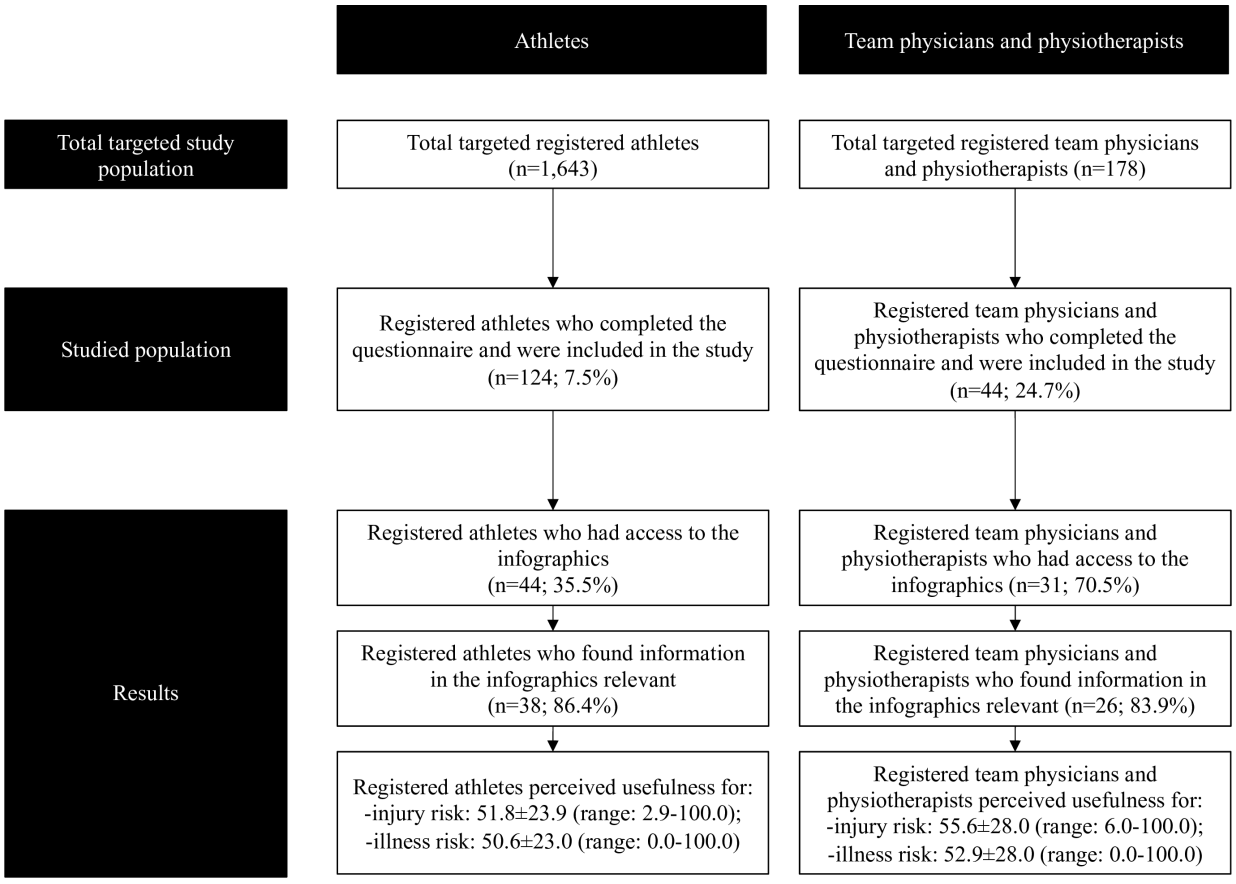

Figure 1 Flow chart of the targeted study population of registered athletes and registered team physicians and team physiotherapists, studied population and results regarding access to the infographics, perceived relevance and perceived usefulness during the 2024 European Athletics Championships.

Foundation for Statistical Computing (Comprehensive R Archive Network, http://www.R-project.org)). Significance was accepted at p<0.05.

RESULTS

Population, participation and response rate

Among the 48 national teams participating in the 2024 European Athletics championships, 35 (72.9%) had a medical team, and 34 (97.1%) participated in the present study by replying at least once to the daily report form. These national teams covered 1611 (98.1%) athletes of the total of 1643 athletes registered at the 2024 European Athletics championships, and the response rate to the daily reports by national medical teams was 100.0%. None of the registered athletes refused to allow their data to be used for scientific research.

Among the 1611 athletes registered at the 2024 European Athletics championships and covered by national medical teams participating in this study, 124 (7.7%) athletes completed the PPHQ (corresponding to 7.5% of the total of athletes participating in the championships) (figure 1). The analysis of the non-responders did not show any meaningful differences in sex between the athletes who completed the PPHQ and those who did not. The analysis of the non-responders showed significant differences between the athletes who completed the PPHQ and those who did not (1) for age categories (higher participation in athletes younger than 20 years; χ^2=31.0, p<0.001), (2) for disciplines (higher participation in athletes from jumps and lower participation in athletes from middle distance and race walking; χ^2=25.2, p=0.001) and (3) for countries (χ^2=429.3, p<0.001). The characteristics of the 124 athletes and their preparticipation injury and illness complaints are presented in online supplemental material.

In-championship injuries and illnesses

76 in-championship injuries were reported, corresponding to an incidence rate of 46.3 (95% CI 36.1 to 56.4) injuries per 1000 registered athletes. 46 illnesses were reported during the championships, corresponding to an incidence rate of 28.0 (95% CI 20.0 to 36.0) per 1000 registered athletes. The characteristics of in-championship injuries and illnesses are presented in online supplemental material.

Information on injury and illness prevention

Among the 124 athletes who completed the PPHQ, about two-thirds of the responders (64.5%) never had access to the infographics (figure 1). Among the 35.5% of responders who had access to the infographics, 86.4% found the information relevant for their practice, and

Table 1 Number of athletes with in-championship injuries and illnesses and number of in-championship injuries and illnesses per 1000 athletes (with 95% CIs), according to their access to the infographics, perceived relevance and usefulness

In-championship injuries	Number of athletes	Number of athletes with an in-championship injury	Number of in-championship injuries per 1000 athletes (with 95% CI)		Usefulness score of infographics among athletes without in-championship injuries (mean (SD) (min-max))	Usefulness score of infographics among athletes with in-championship injuries (mean (SD) (min-max))
No access to infographics	80	7	87.5	(25.6 to 149.4)		
Access to infographics	44	2	45.5	(0.0 to 107.0)	53.6 (23.3) (2.9–100.0)	22.3 (21.0) (7.5–37.1)
Reported no relevance	6	0	0.0	(-)	36.4 (18.3) (10.1–55.1)	
Reported relevance	38	2	52.6	(0.0 to 123.6)	56.0 (23.1) (2.9–100.0)	22.3 (21.0) (7.5–37.1)
In-championship illnesses	**Number of athletes**	**Number of athletes with an in-championship illness**	**Number of in-championship illnesses per 1000 athletes (with 95% CI)**		**Usefulness score of infographics among athletes without in-championship illnesses (mean (SD) (min-max))**	**Usefulness score of infographics among athletes with in-championship illnesses (mean (SD) (min-max))**
No access to infographics	80	1	12.5	(0.0 to 36.8)		
Access to infographics	44	2	45.5	(0.0 to 107.0)	49.9 (23.3) (0.0–100.0)	66.0 (2.6) (64.2–67.8)
Reported no relevance	6	0	0.0	(-)	39.8 (16.3) (10.9–56.0)	
Reported relevance	38	2	52.6	(0.0 to 123.6)	51.5 (24.0) (0.0–100.0)	66.0 (2.6) (64.2–67.8)

their perceived usefulness scores to reduce their risk were 51.8±23.9 (range: 2.9–100.0) for injuries and 50.6±23.0 (range: 0.0–100.0) for illnesses (figure 1).

Among the 178 registered physicians and physiotherapists, 44 (24.7%) replied to the survey regarding the relevance of infographics on injury and illness prevention (figure 1). More than two-thirds of the responders (70.5%) had access to the infographics. Among those who had access to the infographics, 83.9% found the information relevant for their practice, and their perceived usefulness scores to reduce risk were 55.6±28.0 (range: 6.0–100.0) for injuries and 52.9±28.0 (range: 0.0–100.0) for illnesses (figure 1).

Information on injury and illness prevention and in-championship injuries and illnesses

Among the 124 athletes who replied to the PPHQ, an in-championship injury was reported for 9 (7.3%) and an in-championship illness for 3 athletes (2.4%).

The number of in-championship injuries per 1000 athletes was lower in athletes having access to the infographics (table 1). The perceived usefulness values were lower among athletes with in-championship injuries (table 1). The number of in-championship illnesses per 1000 athletes was higher in athletes having access to the infographics (table 1). The perceived usefulness values were higher among athletes with in-championship illnesses (table 1).

The results of the logistic regression analyses with in-championship injury as a dependent variable showed that a higher perceived usefulness score was associated with a lower risk of in-championship injury (OR 0.950; 95% CI 0.877 to 0.996) (table 2). No logistic regression analyses were performed with in-championship illness as the dependent variable, given the number of in-championship illnesses (n=3).

DISCUSSION

The main findings of the present study were that (1) providing injury and illness prevention information through infographics in the context of an international athletics championship to athletes and medical teams was feasible, and a third of athletes and two-thirds of team physicians and physiotherapists had access to this information, (2) more than 80% of athletes and medical teams, who completed the questionnaire and who had access to the infographics, found the infographics relevant, (3) among responders, the perceived

Table 2 Binomial logistic regression analyses with in-championship injury (yes/no) as the dependent variables and (1) access to the infographics (yes/no), (2) perceived relevance (yes/no) and (3) perceived usefulness score, as the independent variables, adjusted for sex, age, main discipline, preparticipation injury complaint (yes/no), preparticipation illness complaint (yes/no), with ORs and 95% CIs

	In-championship injury	
	OR	95% CI
Information on injury and illness prevention		
Access to infographics	0.249	(0.024 to 1.563)
Perceived relevance	0.547	(0.063 to 3.256)
Perceived usefulness score	0.950	(0.877 to 0.996)

For athletes who did not access to the infographics, the perceived relevance was noted as 'no', and the perceived usefulness score was '0'.

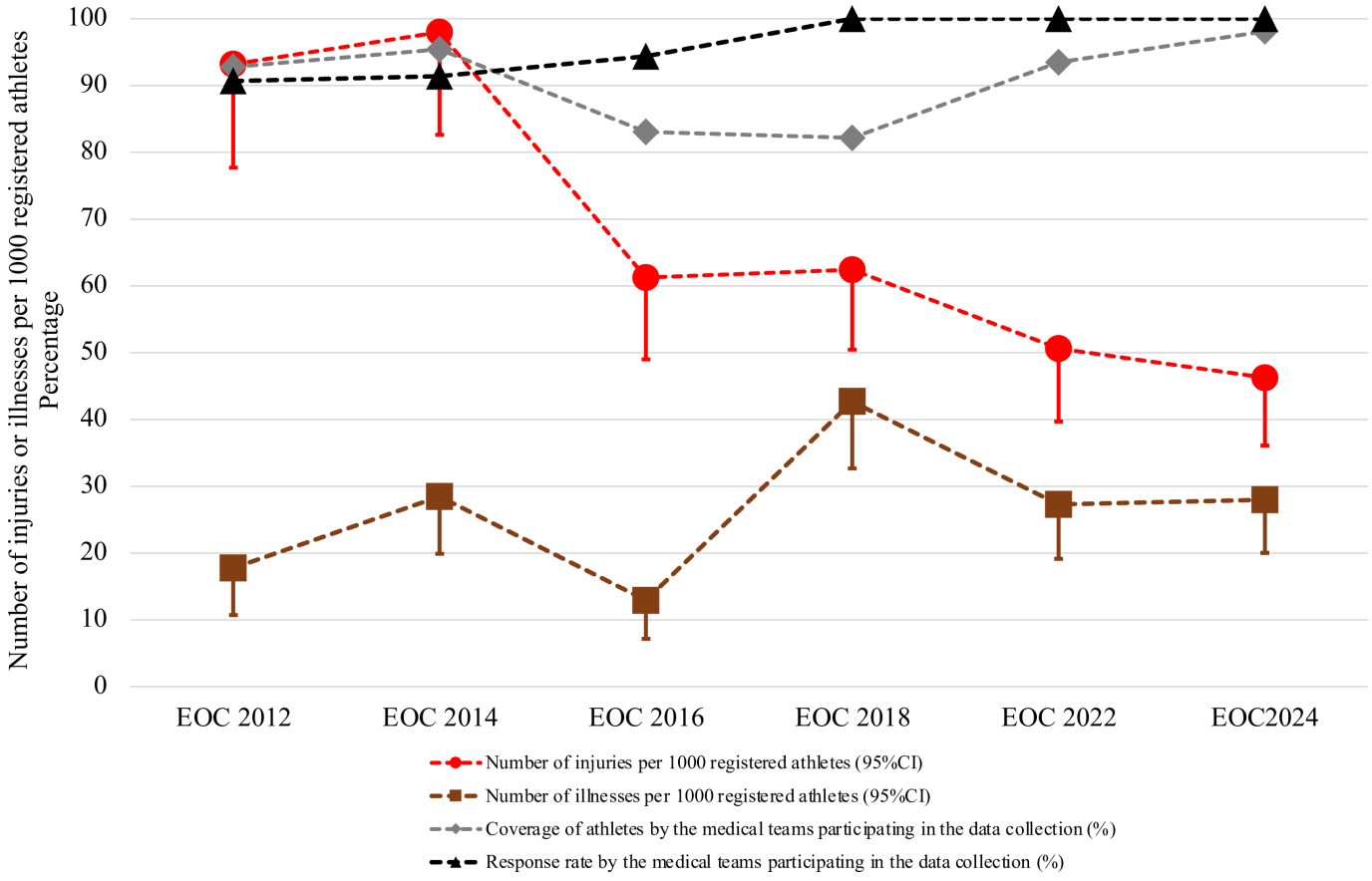

Figure 2 Number of injuries per 1000 registered athletes with 95% CI, number of illnesses per 1000 registered athletes with 95% CI, percentage of athletes covered by the medical teams participating in the injury and illness data collection, and percentage of response rate for the daily injury and illness report forms for the medical teams participating in the injury and illness data collection, during the six previous European Athletics Outdoor Championships (EOC) from 2012 to 2024.

usefulness to reduce injury and illness risks varied extremely from no to maximum usefulness, and (4) the analyses of the potential impact of this information on the injury and illness risks should be taken with caution given the sample size and the number of events: higher perceived usefulness score was associated with lower risk of in-championship injury while no conclusion can be taken for in-championship illnesses.

Everybody should have access to the information if we want to achieve education and promotion of health protection

Two-thirds of responding athletes and one-third of responding team physicians and physiotherapists never had access to the infographics. Although we used several ways of dissemination (ie, team manual, email to medical teams, medical meeting and posters displayed), it seems that it was insufficient to attain all registered athletes, physicians and physiotherapists. If the majority of the targeted audience does not have the information, it reduces the chance of being used in the field. In turn, in our present goal, not having access to the information limits the chance of any reducing impact on the injury and illness risks. There is thus a high need to improve the dissemination of the information. This can be done (1) by identifying the 'bottleneck' of the dissemination process and improving the dissemination of the messages to the targeted audience (eg, more clear information in the team manual, dedicated communication before and during the championships, and systematic and clear displaying of the information in the championships' venues), (2) by finding the optimal method of dissemination (eg, timing and place for education and promotion, media (eg, infographics, videos, smartphone messages)[28]), and (3) by involvement of the end-users during the development of the educational content. To better understand the needs of the athletes and health professionals, further studies using a qualitative approach could be of interest in addition to quantitative studies.

Different needs probably require different approaches

Among those who completed the questionnaire and had access to the infographics, more than 80% of athletes, team physicians and physiotherapists perceived the information provided in the infographics as relevant to their practice. Although this represented a small number compared with the targeted study population, educating and promoting health protection to athletes and medical teams seemed to meet the responders' expectations. These expectations could be linked to the insufficient health literacy reported among athletes.[11–14] Education and promotion approach could help to reduce this

insufficiency. This is also consistent with the fact that this population perceived injury prevention as relevant.[28 29] It seems thus relevant to continue such an approach aiming at injury and illness prevention.

However, the perceived usefulness of the infographics by the responding athletes, team physicians and physiotherapists was average, with important variability among responders: some reported that it has not been of help (score of 0.0) and others of great help (score of 100.0). This result highlights that being relevant for practice does not mean it could be useful. Thus, better determining what could help athletes and medical teams is needed. These results also highlight that injury and illness prevention approaches, such as education and health protection promotion, should be tailored and that one size does not fit all. Each athlete/team does not need the same information.

Impact of education and promotion of health protection in injury and illness risk

Given the number of athletes and in-championship injuries, the present results of the potential positive impact of prevention information to reduce the risk of in-championship injuries should be considered only as preliminary results and should be taken with caution. However, the injury incidence rate of 46 injuries per 1000 registered athletes was lower than the 104 reported during previous international athletics championships[3] and compared with the 6 previous European Athletics outdoor championships (figure 2). This represents an additional argument supporting the potential interest of such a preventive approach. However, injury and illness occurrence is multifactorial, so their prevention should be, too. Although educating and promoting health protection may be one way, other strategies could have played a role, and there could be confounding factors influencing the present results. Thus, it is difficult to conclude the effect of the information on injury and illness prevention on the injury and illness risk during the same championships. However, given the theoretical background on the potential interest of educating and promoting health protection to reduce injury and illness risks,[8–10] as well as the perceived relevance reported by the responding athletes and medical teams in the present study, and that some responding athletes and medical teams perceived high usefulness, it seems relevant to continue exploring this prevention approach.

Strengths and limitations

As a major strength of this study, we must mention that this was performed in an international competition with elite athletes. This was not an experimental context. The information was provided to the athletes during a major continental event, which can represent their season goal, and they actively participated in the questionnaire in such a context.

Some limitations regarding the PPHQ have already been discussed in previous articles[2 17 24–26] and are still valid for the present study. We have to acknowledge the small sample of athletes (n=124) compared with the total study population (n=1643), which was not fully representative of this total targeted population (based on the non-responders analysis). However, we can also counterargue that we included elite athletes in the context of international championships. It was impossible to analyse the cause–consequence relationships regarding injury/illness and the perceived relevance/usefulness of the provided information. Some potential confounding factors were not collected, affecting the risk of injury and illness.

Practical implications

Our results show the feasibility of promoting health protection and educating athletes and their teams through infographics on injury and illness prevention in international athletics championships. Their reported perceived relevance is encouraging. The relatively small proportion of athletes and medical teams who accessed the information highlighted the need to improve the dissemination of the information, as suggested above (eg, preference analysis, co-constructions and improved communication). Since athletes have important relationships with their coaches, efforts should be made to include coaches among the recipients of the infographics. In addition, the important variation in the perceived helpfulness highlighted the potential need to tailor this approach towards individual preferences. This can be done by providing information according to the gaps in health literacy.

CONCLUSIONS

Our study shows that providing athletes and medical teams with information on injury and illness prevention through infographics was feasible during an international athletics championship. Although no clear conclusion can be drawn about the potential impact of prevention information on injury and illness risk, the present study's findings support the interest in continuing such an injury and illness prevention approach.

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Contributors PE, SI, LN, PB, KH and P-ED conceived the study; PE, SI and P-ED participated in the data collection; PE, SI and P-ED discussed and performed data analyses; PE drafted the manuscript; and all coauthors 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

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Competing interests None declared. PE is an associate editor for the British Journal of Sports Medicine and the Scandinavian Journal of Medicine & Science in Sports. KH is an editor for the German Journal of Sports Medicine. PE and KH are associate editors for the BMJ Open Sports and Exercise Medicine. KH is the head team physician of the German Athletics Federation.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study was reviewed and approved by the Saint-Etienne University Hospital Ethical Committee (Institutional Review Board: IORG0007394, IRBN732024/CHUSTE). All athletes were informed about the study aim and procedure, that their data are used for research, and their rights to refuse to use their data for research. No signed informed consent was required by the ethical committees.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. Data are available on reasonable request. Requests for data sharing from appropriate researchers and entities will be considered on a case-by-case basis. Interested parties should contact PE (pascal.edouard@univ-st-etienne.fr).

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