BMJ Open Sport & Exercise Medicine

Context of injury prevention strategies in Swiss basketball: survey of athletes, medical staff and coaches

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To cite: Bel L, Duc M, Bizzini M, *et al*. Context of injury prevention strategies in Swiss basketball: survey of athletes, medical staff and coaches. *BMJ Open Sport & Exercise Medicine* 2022;**8**:e001386. doi:10.1136/bmjsem-2022-001386

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjsem-2022-001386).

Accepted 22 November 2022

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ABSTRACT

Objectives This project aims to assess opinions, attitudes, knowledge, beliefs, practices and perceived barriers and facilitators of injury prevention (IP) strategies in Swiss basketball teams.

Methods An online survey was sent to athletes, coaches and medical staff of the three best basketball leagues in Switzerland. The survey was subdivided in four sections: (1) characteristic of participants, (2) knowledge, opinions, attitudes and beliefs, (3) practices and (4) barriers and facilitators.

Results Among 105 persons (n=45 female, n=60 male) who answered the survey, more than 60% (n=68) considered the risk of injury for basketball athletes as being high to very high. The ankle, knee and the hand were considered as being the most at risk. More than 80% of participants considered that recovery, training load and the warm-up quality were very important factors for IP. More than 90% of participants considered IP as either important or very important with 53 (50.5%) of the participants indicating using exercise-based IP in their clubs. Athletes and coaches' motivation and compliance were judged as either important or very important for successful IP implementation by more than 80% of participants, with the coach being reported as the most influential person. Environmental barriers towards human or infrastructural resources were also reported as factors influencing IP strategies, namely by female participants.

Conclusion Good knowledge and positive attitude towards IP were reported by participants, but exercise-based IP strategies lack implementation. The coach was considered as the most influential person and was reported with the athletes as playing an important role towards successful implementation.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ There is some evidence that exercise-based intervention tailored to prevent lower limb injuries demonstrate efficacy in basketball, showing a reduction in general lower extremity injuries.
⇒ Understanding the context in which we want to implement injury prevention strategy is key for success.

WHAT THIS STUDY ADDS

⇒ Positive attitude and good knowledge about injury prevention were demonstrated by participants but only 50.5% indicated having exercise-based injury prevention performed in their clubs.
⇒ Environmental barriers were reported by female basketball players and it could influence injury prevention practice for this population.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our results allow us to better understand the context around injury prevention in the Swiss Basketball League.
⇒ The results and the new data on this context will allow for a work towards implementing evidence-based injury prevention strategies in the Swiss Basketball League.

INTRODUCTION

Basketball players have one of the highest overall injury rates among non-collision sports participants.[1] Among male and female players, lower limb (LL) injuries predominate in the ankle (21.9%), which is the most frequently injured site, followed by the knee (17.8%).[2 3]

There is some evidence that exercise-based interventions tailored to prevent LL injuries demonstrated efficacy in basketball, showing a reduction in general lower-extremity injuries.[4] Based on the available evidence, exercise-based neuromuscular warm-up interventions play a significant role in injury prevention (IP) in basketball,[5 6] with specific IP programmes showing efficacy in preventing ankle injuries in mixed elite youth and young senior basketball players,[7] and anterior cruciate ligament injuries in college female basketball players.[8] Exercise-based interventions can be combined using load management strategies and equipment such as mouthguards.[6] Other interventions, such as external ankle support, are encouraged because studies have shown that they could lead to a decreased risk of injury.[1] Furthermore, the FIFA11+, a programme initially conceived to prevent LL injuries in football,

composed of plyometric exercises, strengthening and running drills, also showed efficacy in preventing general LL injuries in youth male basketball players (OR 0.404 (95% CI 0.194 to 0.839)).[9]

Although it is well documented that exercise-based interventions can prevent injuries in basketball players, the implementation of effective IP interventions in real-life remains a challenge.[9–12] Finch suggested a framework (TRIPP) that aims at overcoming the observed implementation gap. Understanding the context of implementation—personal, environmental, societal and sports-specific delivery factors—makes part of the first step of this framework.[12] Furthermore, Bolling *et al* insist on the need to understand the athlete's relationship with prevention in their specific context.[10] It was suggested that instead of focusing on whether an intervention is efficient for a specific problem, the questions should focus on how the contexts impact this problem. Another relevant point to consider is that focusing on the injury itself can be misleading because the athlete's definition of an injury is context-dependent and can be influenced by different factors, such as competition schedule and performance level.[13] As suggested by Verhagen, injury-preventive measures must be developed around the athlete, not around the injury.[14]

To our knowledge, no study has evaluated whether IP strategies are used in the Swiss Basketball League (SBL). Therefore, this study aimed to assess athletes, medical and coaching staff's (1) knowledge, opinions, attitudes and beliefs towards IP, (2) current IP practice and (3) perceived barriers and facilitators for IP implementation.

METHODS

Participants

All players, coaches and medical staff in 60 teams from the three best divisions of male and female basketball leagues in Switzerland were invited to participate in this study. To facilitate the approach with the clubs, we contacted the SBL to ask for help distribute the questionnaire to the clubs. The SBL's role was to send the first email to all the clubs' presidents to ask them to transfer the questionnaire to the athletes, coaches and medical staff.

Survey

We originally created a survey in French based on different models existing in the literature that evaluated the same construct we chose to evaluate.[15–17] We submitted the survey to three experts. The three were physiotherapists selected for their academical and clinical expertise in the field of IP and basketball. Once we agreed on a final version, the survey was pilot tested by five persons before being sent. Two physiotherapists, one coach and two ex-basketball players, were involved in the pretest. We asked them to evaluate (1) the structure of the questionnaire, (2) the sequence of the questions, (3) the clarity of the instructions, (4) the relevance of the questions and (5) repetition of the questions. Finally, we asked them to assess (6) their wording and spelling. After the first pilot test, we made modifications according to the testers' comments. In total, two rounds of modifications were necessary. Finally, the survey was translated forward from French into German, Italian (two other official Swiss languages) and English by native speakers.

Administration

The survey was administered using REDCap hosted at HES-SO Valais-Wallis. The link to the survey was sent by email to the president of the concerned clubs at the beginning of the 2021–2022 season, using the official mail of the SBL. After 2 weeks, we sent reminder emails to the concerned teams, directly contacting the technical director and coaches. After 4 weeks, we sent an email to the club's coaches. A final reminder was sent after 8 weeks. Data were extended from 15 November to 19 January.

Survey analysis

The data were exported from REDcap to Excel. Anthropometric data are reported in a table as frequencies and percentages. The means and SD were used when appropriate. For categorical variables, binary variables and items using a Likert scale, frequencies and percentages were reported. To determine if there was an association between league level and IP practices, the χ^2 test of independence was used. Statistical significance was set at $p \leq 0.05$.

RESULTS

Participant characteristics

We received a completed questionnaire from 105 people out of a potential of approximately 600 (17.5% response rate). The anthropometric data are presented in table 1.

Athletes' mean overall career length was 10.4 (±6.2) years, while the mean number of years spent in their actual league was 3.9 (±3.2) years.

All the coaches had previous experience as basketball athletes with a mean career of 20.4 (±8.3) years. Their mean coaching experience was 17.6 (±11.0) years.

Five (100%) conditioning trainers reported having a sports specialisation, while one (20%) physiologist and one (50%) medical doctor reported being specialised in sports. Seven (58.3%) participants of the medical staff indicated having previous experience as players, with a mean career length of 16 (±11.9) years. The mean experience as a medical professional in basketball was 5.7 (±4.8) years.

Knowledge

The participants were asked about their risk of injury as basketball players. Sixty-eight (64.8%) participants considered the risk to be either high or very high. Of the 105 participants, 12 (11.4%) considered the risk to be the highest before the season started and 93 (88.6%) considered it to be the highest during the season; 103 (98.1%) considered that it is possible to reduce the risk of injury in basketball, while 2 (1.9%) disagreed.

Table 1 Demographics of participants (n (% of responders per question))

	Athletes (n=77)	Coaches (n=16)	Medical staff (n=12)
Gender	Male: 37 (48.1) Female: 40 (51.9)	Male: 13 (81.2) Female: 3 (18.8)	Male: 10 (83.3) Female: 2 (16.7)
Age (mean±SD)	23.0±5.5 years	45.7±7.8 years	40.0±15.2 years
Nationality	Swiss : 66 (85.7) France : 3 (3.9) Belgium : 2 (2.6) Other : 6 (7.8)	Swiss : 9 (56.3) Belgium : 1 (6.2) Italy : 2 (12.5) Other : 4 (25.0)	Swiss : 10 (83.3) Italy : 2 (16.7)
Role	Point Guard : 23 (29.9) Shooting Guard :15 (19.5) Small Forward : 23 (29.9) Power Forward : 12 (15.5) Centre: 4 (5.2)	Head Coach : 14 (87.5) Assistant Coach : 2 (12.5)	Medical Doctors : 2 (16.6) Physiotherapist : 5 (41.7) Conditioning Trainer : 5 (41.7)
Education level	CE : 7 (9.1) GED : 28 (36.3) VED : 12 (15.6) PED : 1 (1.3) UD : 29 (37.7)	GED : 3 (18.8) VED : 1 (6.2) PED : 4 (25.0) UD : 8 (50.0)	UD : 12 (100.0)
League	SBL Men: 9 (11.7) SBL Women: 6 (7.8) NLB Men: 16 (20.8) NLB Women: 27 (35.0) NL1 Men: 15 (19.5) NL1 Women: 4 (5.2)	SBL Men: 2 (12.5) SBL Women: 3 (18.75) NLB Men: 3 (18.75) NLB Women: 3 (18.75) NL1 Men: 3 (18.75) NL1 Women: 1 (6.25) N/A: 1 (6.25)	SBL Men: 6 (50.0) SBL Women: 2 (16.7) NLB Men: 3 (25) NLB Women: 1 (8.3)

The 'other' nationalities reported were: Serbia (n=2), USA (n=1), Croatia (n=1), Spain (n=1), Senegal (n=1), Kosovo (n=1), Congo (n=1), Swiss-Italy (n=1) and Swiss-Turkey (n=1).
CE, compulsory education; GED, general education diploma; N/A, non-answered; PED, professional education diploma; SBL, Swiss Basketball League; UD, university diploma; VED, vocational education diploma.

When asked to classify the body region that they considered to be the most at risk for injuries, participants identified the ankle, knee and hand as being the most injury-prone. Recovery (sleep and nutrition), training load and warm-up quality were the main risk factors reported by participants (figure 1).

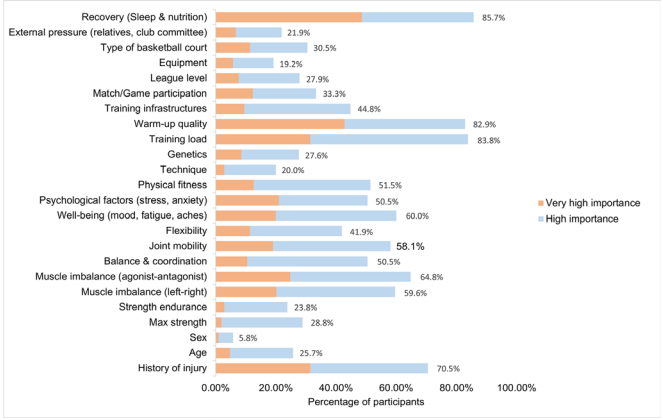

Figure 1 Participants rating of the importance of intrinsic and extrinsic risk factors of injuries (% of participants that answered either very high importance or high importance).

Opinions, attitudes and beliefs

A positive attitude towards IP was reported by 96 (91.4%) persons considering IP as very important or important.

The participants' opinions on different strategies and their efficacy in reducing the risk of injury are shown in figure 2. The most important perceived benefits of performing an IP programme are the reduction in injury risk (n=96, 91.4%) and improvement in overall athletic

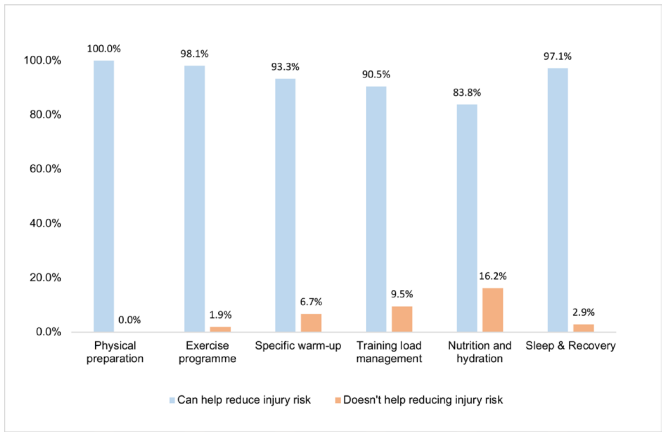

Figure 2 Different strategies and their efficacy in reducing injury risk according to participants (% of participants).

Table 2 Training modalities performed in the clubs and frequency per week (n (% of participants per question)

	SBL			NLB			NL1		
	Never	1×/week	>1×/week	Never	1×/week	>1×/week	Never	1×/week	>1×/week
Warm-up	2 (7.1)	0 (0.0)	26 (92.9)	2 (3.8)	1 (1.9)	50 (94.3)	1 (4.3)	3 (13.0)	19 (82.6)
Movement preparation	3 (10.7)	2 (7.1)	23 (82.1)	10 (19.6)	8 (15.7)	33 (64.7)	5 (22.7)	5 (22.7)	12 (54.5)
On court strength training	10 (37.0)	7 (25.9)	10 (37.0)	15 (29.4)	24 (47.1)	12 (23.5)	10 (45.5)	9 (40.9)	3 (13.6)
Strength training before/ after training	12 (44.4)	4 (14.8)	11 (40.7)	24 (47.1)	14 (27.5)	13 (25.5)	15 (68.2)	4 (18.2)	3 (13.6)
Strength training in a specific session	5 (20.0)	5 (20.0)	15 (60.0)	24 (47.1)	16 (31.4)	11 (21.6)	13 (59.1)	7 (31.8)	2 (9.1)
On court mobility training	5 (19.2)	7 (26.9)	14 (53.8)	18 (35.3)	19 (37.3)	14 (27.5)	10 (45.5)	2 (9.1)	10 (45.5)
Mobility training before/ after training	13 (54.2)	3 (12.5)	8 (33.3)	29 (56.9)	8 (15.7)	14 (27.5)	19 (86.4)	1 (4.5)	2 (9.1)
Mobility training in a specific session	13 (54.2)	4 (16.7)	7 (29.2)	37 (72.5)	9 (17.6)	5 (9.8)	17 (77.3)	2 (9.1)	3 (13.6)
Coordination training	8 (33.3)	9 (37.5)	7 (29.2)	18 (35.3)	19 (37.3)	14 (27.5)	9 (40.9)	8 (36.4)	5 (22.7)
Sprint	7 (29.2)	12 (50.0)	5 (20.8)	21 (40.4)	22 (42.3)	9 (17.3)	8 (36.4)	4 (18.2)	10 (45.5)
Cooldown	11 (44.0)	2 (8.0)	12 (48.0)	26 (51.0)	11 (21.6)	14 (27.5)	14 (63.6)	4 (18.2)	4 (18.2)
Injury prevention protocols (eg, FIFA11+)	18 (75.0)	4 (16.7)	2 (8.3)	37 (72.5)	6 (11.8)	8 (15.7)	20 (90.9)	0 (0.0)	2 (9.1)
Other	21 (95.5)	0 (0.0)	1 (4.5)	45 (90.0)	2 (4.0)	3 (6.0)	20 (90.9)	0 (0.0)	2 (9.1)

'Other' answers in table 2 included 'stretching', 'exercise protocols for specific body parts', 'practice other sports' and 'sleep'.
n, number of participants; NL1, National League 1 Men and Women; NLB, National League B Men and Women; SBL, Swiss Basketball League Men and Women.

performance (n=84, 80%). More details on perceived benefits are provided in online supplemental appendix 1. The importance of these benefits was considered very important by 39 (37.1%) participants, important by 52 (49.5%) and moderate by 12 (11.4%).

Thirteen (12.4%) participants answered that performing an IP intervention once a week was sufficient to reduce risk, 40 (38.1%) answered twice a week, while the other participants answered three times a week or more (n=52, 49.5%).

Current IP practice

Overall, 60 (57.1%) persons announced having their team perform an IP workout or other strategy in the last 24 months, while 25 (23.8%) did no, and 20 (19%) indicated that they did not know whether their team performed an IP workout. The target body areas for the IP workout were mainly the LL: (55 (52.4%) participants performed IP interventions for the ankle, 51 (48.6%) for the knee, 38 (36.2%) for the lower leg, 31 (29.5%) for the thigh and 26 (24.8%) for the hip and trunk. Fifty-three (50.5%) participants indicated that their team implemented exercise-based interventions to decrease the risk of injuries. IP interventions were performed off-season for 29 (27.6%) participants and during the season for 45 (42.9%) participants. More details on when these interventions were performed can be found in online supplemental appendix 2.

Table 2 describes the overall modalities performed in the clubs and their frequencies according to the participants (table 2). Participants reported having training planned for 3.5 (±1.5) days a week. There were two significant differences in the league level and the frequencies at which some training modalities were performed. More details can be found in online supplemental appendix 3.

Perceived barriers and facilitators

Fifty (47.6%) participants reported that the athletes were the most responsible for IP, followed by the coach coming in second (n=32, 30.5%).

Most participants considered the team's compliance as either very important (n=48, 45.7%) or important (n=41, 39%). Similar results were observed for trainer compliance, with 58 (55.2%) participants considering it very important and 36 (34.3%) considering it important.

The head coach was considered the most influential coach by 45 (42.9%) participants. The conditioning trainer came second (n=33, 31.4%), followed by the athlete (n=14, 13.3%).

The perceived importance of different facilitators can be found in table 3.

Environmental barriers in women's basketball

Participants were asked to answer six statements regarding women's basketball. Table 4 presents the results.

DISCUSSION

To our knowledge, this study is one of the first to analyse the context of IP in basketball. We included the three

Table 3 Participants perceived importance of different factors in regard to facilitating the implementation of injury prevention strategies (n=105, % of participants per question)

Factors	Very important	Important	Moderate	Less important	Not important	Don't know
Trainer's motivation	50 (47.6)	41 (39.0)	11 (10.5)	1 (1.0)	1 (1.0)	1 (1.0)
Athlete's motivations	74 (70.5)	27 (25.7)	3 (2.9)	0 (0.0)	0 (0.0)	1 (1.0)
Training of the athlete's support staff (physiotherapist, conditioning trainer…)	56 (53.8)	40 (38.5)	6 (5.8)	0 (0.0)	0 (0.0)	2 (1.9)
Duration of the injury prevention programme (in minutes)	19 (18.3)	43 (41.3)	33 (31.7)	7 (6.7)	1 (1.0)	1 (1.0)
Available infrastructures	11 (10.5)	34 (32.4)	33 (31.4)	18 (17.1)	8 (7.6)	1 (1.0)
No of training sessions per week	16 (15.2)	44 (41.9)	30 (28.6)	9 (8.6)	4 (3.8)	2 (1.9)

n, number of participants.

Table 4 participants' opinion on environmental barriers to injury prevention related to women's basketball in comparison with men's basketball (n=number of participants (% of participants per question))

	Male (n=60)				Female (n=45)			
Gender	Agree or completely agree	Neutral	Disagree or completely disagree	Don't know	Agree or completely agree	Neutral	Disagree or completely disagree	Don't know
Female athletes have reduced infrastructures access (eg, basketball court, gym)	13 (21.7)	8 (13.3)	25 (41.7)	14 (23.3)	26 (57.8)	10 (22.2)	7 (15.6)	2 (4.4)
Female athletes have reduced physical preparation structure access (eg, gym)	11 (18.3)	11 (18.3)	25 (41.7)	13 (21.7)	32 (71.1)	5 (11.1)	6 (13.3)	2 (4.4)
Female athletes have reduced trainer access (eg, gym)	9 (15.0)	13 (21.7)	25 (41.7)	13 (21.7)	29 (64.4)	10 (22.2)	4 (8.9)	2 (4.4)
Female athletes have reduced medical resources access	12 (20.0)	7 (11.7)	29 (48.3)	12 (20.0)	19 (42.2)	10 (22.2)	15 (33.3)	1 (2.2)
Female athletes have team staff with less qualifications	11 (18.3)	10 (16.7)	27 (45.0)	12 (20.0)	26 (57.8)	9 (20.0)	10 (22.2)	0 (0.0)
Female athletes have reduced human resources access (eg, no of coaches, people in the medical team)	18 (30.0)	8 (13.3)	22 (36.7)	12 (20.0)	40 (88.9)	4 (8.9)	1 (2.2)	0 (0.0)

n, number of participants.

best leagues in Switzerland, which allowed us to look at differences related to level and gender.

The objectives of this study were to assess the overall IP situation in the SBL to better understand participants' views and knowledge, and to evaluate current IP practices and perceived obstacles towards IP implementation. This study showed that despite participants having overall good knowledge and positive views about IP, only half of them reported having their team use exercise-based interventions.

Performance and prevention

Performance has been described as one of the biggest drivers in performing prevention training, the latest being sometimes considered an accessory goal towards performance.[13 18] For years, it has been suggested that if exercise-based IP programmes show performance enhancement effects, implementation could be facilitated.[19] This argument seems to be of even greater value for coaches.[20–23] In our sample, coaches have been described as playing a key role in the implementation of IP programmes and on-field performance was one of the perceived benefits of IP for 80% of the participants. Given that these programmes demonstrate an overall improvement in performance criteria,[24] this may be an argument that we should insist on more when trying to convince teams to implement these interventions. As a perfect programme for basketball may not yet exist, it is important to reflect on how we could create a programme that could be highly adopted by the teams. When creating an IP programme for basketball, it would need to reflect the demand of the sport and be challenging enough to increase performance, which could in turn increase adherence, which is key to obtaining the greatest effect from these programmes. For that to happen, involving coaches and athletes would be a great first step in the right direction, as co-creation has been suggested as a way to facilitate IP implementation.[25–30]

It has been suggested that strength training has an impact on sports performance, as it is correlated with better jumping and sprinting abilities, change in direction capacity and sport-specific performance.[31] Strength training was underperformed in our sample, especially in the NLB and NL1 leagues. There is a tendency that the higher the league level is, the higher the frequency of strength training. However, these differences were not statistically significant (see online supplemental appendix 3). We argue that finding a way to include more strength training when conceptualising future programmes could help increase performance and reduce the risk of injuries, as strength has been described as one of the most important factors in multimodal IP programmes compared with stretching or proprioception.[32] It has been proposed that increasing the volume and intensity of strength training leads to a reduction in injury risk.[33] That is a point on which participants could need more education, as maximal strength was rated as a low importance risk factor for injury.

Barriers to IP

There are many barriers to implementation that are currently studied in the literature, such as coach knowledge, lack of sport-specific exercises, lack of time and lack of resources.[34 35] This study adds to the literature on gendered barriers towards IP. With regard to the study by Parsons *et al*,[36] we decided to explore the role of gender and how men and women perceived women's basketball in Switzerland. The majority of female participants agreed that women's basketball had considerable barriers to access to training infrastructure and medical and human resources. We argue that, in the context of Swiss basketball, female athletes encounter an additional environmental barrier to IP implementation compared with their male counterparts. Providing more access to health professionals to female athletes could improve IP among teams as it could allow for an interdisciplinary approach in the creation of an IP strategy, which is considered important.[25 26 37] Furthermore, if there is no access to health professionals in clubs, it could mean that there is no way to have a broader view of IP. Ekstrand *et al* suggested that when the head coach and medical staff had good communication, the consequences and injury rates were lower.[38] In our case, there could be no exchange between the coach and medical staff, as there may be some cases, especially at the lower level, where no health professionals are available.

Limitations

The main limitation of this study was the relatively low response rate (17.5%), which could be attributed to various reasons. It is important to note that we changed our strategy to recruit participants. Given the low response rate, two supplementary reminders were sent to the coaches. This allowed more direct contact with the people concerned with this study. Overall, four reminders were sent, and we kept the survey open for answers for 2 months instead of one. Since our sample size was small, all results need to be interpreted with caution.

Participants may have been biased with an interest towards the IP topic, considering that more than 80% of the potential target groups did not answer the survey. We can hypothesise a selection bias since athletes with a history of injury or medical and coaching staff interested in IP could have been more prone to participate. We attempted to reduce this risk by using a digital questionnaire for easier accessibility. Despite our efforts to reduce this risk, the results should be interpreted with caution as they may overestimate the good knowledge and attitudes that participants reported in their answers.

Another limitation was the risk of recall bias. This risk could be increased by the COVID-19 pandemic since only the SBL men and SBL women conserved the possibility of training and competing normally for most of the 2020–2021 season. The other leagues did not train for the largest part of 2020–2021 and the competition calendar was cancelled after a few weeks. To reduce this

risk, we have attempted to avoid requesting historical information.

It is important to note that our survey did not include open-ended questions, which could provide us with further information. To partially resolve that problematic, we allowed participants to write customised answers when we thought it was relevant using an option named 'other'. This allowed the participants to add answers that were not listed if they wanted to. Even though we focused on quantitative data, our findings provide information regarding the context IP in the context of basketball, area where no such studies exist to our knowledge.

As the results mainly concern people with Swiss nationality (81%), they may vary from country to country due to cultural and socioeconomic differences that could exist.

Future research

Future research should consider including qualitative data that could provide further information regarding the specific context of basketball. Furthermore, introducing an injury surveillance system in SBL could allow us to better understand the burden of injury, which could lead to the creation of tailored IP interventions.

CONCLUSION

Good knowledge and positive attitudes towards IP were reported by the participants, but exercise-based IP strategies lacked implementation, with only 53 (50.5%) participants using them. Differences in practice were not significant between league levels, but strength training tended to be more frequently used at the highest level. The coach was considered as the most influential person and was reported with the athletes as playing an important role towards successful implementation.

Adopting an injury surveillance system in the SBL would be the first step towards the successful development of IP strategies. Co-creating challenging and sport-specific interventions with coaches and athletes could be an adequate follow-up strategy to facilitate the dissemination and implementation of IP strategies in these leagues.

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Acknowledgements We want to thank the Swiss Basketball League for their help in distributing the survey hyperlink to the teams. Special thanks to the participants for their participation in realising this study. Finally, a big thank to 'Shishu' from Editage (www.editage.com) for the English language editing.

Contributors This study was designed by LB, MD, P-EF, LA. Communication to the teams was via LB. Data were collected and analysed by LB; data interpretation and manuscript preparation were undertaken by LB, MD, MB, LA. All authors approved the final version of the paper. LB acts as guarantor.

Funding The authors disclose receipt of financial support from Physioswiss—the Swiss national physiotherapy association—for publication of this article.

Competing interests None declared.

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 local medical ethics committee exempted this project from submitting a request as associated anonymous health-related were collected anonymously using REDCap (Research Electronic Data Capture) The first question of the survey asked if the participants consented to participate and had their answers used for analysis and publication.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are not publicly available. The data used in this study are available on reasonable request from the corresponding author (LB). The data are not publicly available for ethical reasons to guarantee not to compromise the privacy of research participants.

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