

**Introduction**

Approximately 1.7 million citizens within the EU-27 area play basketball regularly. Recent research shows an injury incidence of 3-6 injuries/1000h. Thus, one has to expect at least 720,000 basketball-related injuries a year causing direct medical costs of approx. € 500 million. The purpose of this poster is to illustrate smart ways how to prevent basketball injuries in a sustainable manner.

**Methodology**

**1) Database & Literature Search**

PubMed, the Cochrane library, SportDiscus, BISP-databases and EMIP were browsed, using multiple combinations of the keywords INJUR\*, PREVENT\* and BASKETBALL. A total of 4079 articles were identified. After title and abstract review and removal of duplicates 48 publications were considered for detailed review. In addition a multi-lingual web search using Google.com was conducted. This approach compiled another 33 references for the advanced reviewing process. Following the reference lists of the retrieved articles were manually scanned for further information. Additionally, available authors and co-authors had been contacted for complementing the findings with articles from their personal archives (Fig.1).

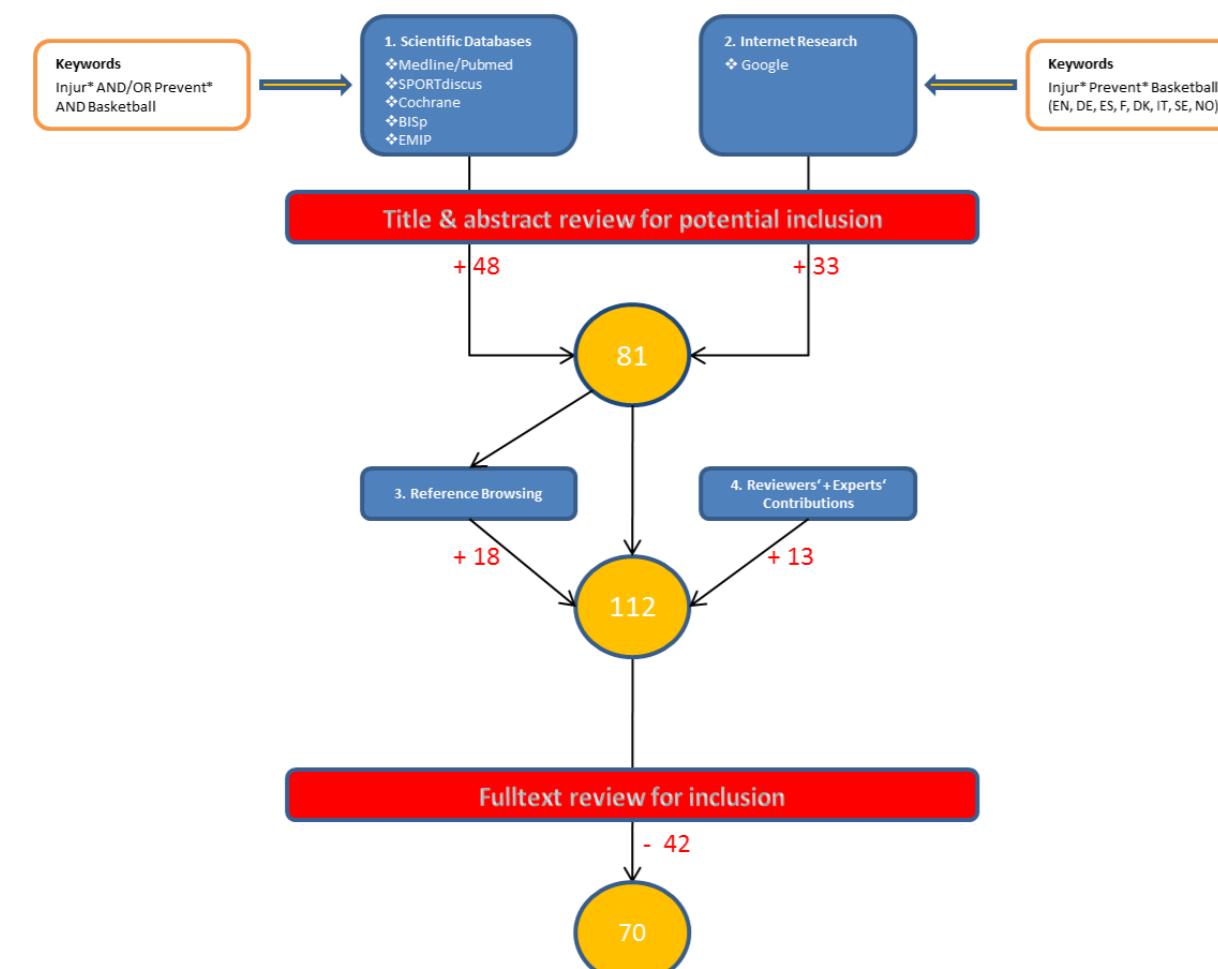


Fig. 1: Literature Flow

**2) Consensus Building**

The invited experts should grade the clearly depicted preventive recommendations of each source from their individual point of view and with regard to the following definitions of the evaluation criteria:

- potential **EFFICACY** in terms of reducing injuries (i.e. injuries become less frequent or less severe)
- potential **APPLICABILITY** in terms of required effort for realisation (i.e. low time, financial, material and personnel expenditures)
- potential **ACCEPTANCE** within the community (i.e. execution in compliance with athletes, coaches and associations e.g. adoption into curricula of trainer education; becoming well known integral part of training, becoming a mandatory rule)

**3) Test Implementation**

Literature search and consensus building led to a “Prevention Toolbox”, containing most promising preventive approaches. Parts of it were test implemented in Slovak and Swedish basketball federation. Therefore, meetings with experts from both pilot federations and from the FIBA Europe were held to tailor the implementation according to respective national demands, resources and requirements. Target group for the implementation were coaches, as the identified main area “Training & Physical Preparation” is their explicit remit. A critical reflection of the test implementation led to a refinement of the original “Prevention Toolbox” according to experienced deficits. Moreover, instructors were educated and curricula were established or adapted to guarantee sustainability.

**Results**

Not all sources have just one single recommendation and therewith solely address just one of the four defined prevention fields. All in all the identified 70 sources include 109 recommendations. Table 1 gives an overview of the recommendations in relation to the addressed prevention field and their validity.

	Training & Physical Preparation	Technical & Political Approaches	Equipment & Facilities	Medical & Non-medical Support	
Multiple scientific validation	15	2	9	0	26 (24%)
Single scientific validation	15	3	11	3	32 (30%)
Science-based	11	6	9	2	28 (25%)
Multiple expert recommendation	4	2	4	1	11 (10%)
Single expert recommendation	7	1	4	0	12 (11%)
	52 (47%)	14 (13%)	37 (34%)	6 (6%)	109

Tab. 1: Categories of preventive measures

Nearly half of all recommendations address the field of “Training & Physical Preparation” (47%), followed by “Equipment & Facilities” (34%). These both fields are also judged as high efficient and applicable, contrary to “Medical and Non-medical Support” with the lowest acceptance. Science related preventive measures which meet scientific requirements are seen as most efficient, applicable and accepted. The online evaluation process resulted in the following top recommendations concerning the four different fields of injury prevention:

**1) Training and Physical Preparation**

- Basic physical preparation

Players at all levels and ages need a proper basic athletic condition as to endurance, strength, flexibility and speed. Athletes in bad athletic condition are significantly more vulnerable for acute injuries and in particular for developing overuse symptoms (e.g jumper’s knee, low back pain). Structured athletic conditioning programmes should be offered as part of pre-season physical preparation and condition training during seasons. Such programmes should include individually adapted endurance training, functional weight training, dynamic mobilization and agility drills.

- Structured warm-up routines

General cardiovascular activation for 10-20 minutes prior to basketball sessions is essential and should include basic running drills but also neuromuscular, proprioceptive and balance exercises, core stabilization as well as coordination practices. Plyometrics and agility drills should be included at the end of warming up.

- Basic and advanced technique training

Technique training is not only most helpful in enhancing the game performance of athletes but also to reduce the risks related to crucial movement patterns and game situations. Proper jumping and landing technique in terms of knee and ankle control help athletes to sustain crucial situations like single-leg landings. Correct ball handling is an important factor to prevent numerous finger sprains and quick and controlled feet assist in coping pivoting movements.

- Neuromuscular training

There is sufficient scientific evidence that exercises on unstable devices such as wobble boards, slings or mats in combination with core stabilization and plyometrics are helpful when conducted regularly (at least 1-2 times per week) during preseason and season. These training components can be easily integrated into warmup routines and have even stronger positive effects while athletes are not yet tired out.

**2) Technical and political measures**

- Awareness raising

Individual athletes and coaches and the responsible staff in clubs and federations need to systematically share information on basketballspecific injuries, risk factors, injury mechanisms as well as available knowledge on effective, applicable and acceptable countermeasures.

- Adaptation of the education programmes

The development and implementation of a safety management scheme at club level and at national level should be one of the core learning objectives within current curriculums for continuous education of coaches and club managers.

- Restriction on number of matches

Sufficient regeneration will reduce overuse symptoms and acute injuries due to fatigue or inadequately cured disorders. Therefore, for professional players but also for lower level players, a revision of the competition schedule can help to shrink the dramatic number of injuries during and immediately after (inter-) national competitions.

**3) Equipment and facilities**

- Mouth Guards

Custom-made mouth guards have shown to prevent dental and orofacial injuries as well. It is therefore strongly recommended that basketball players, in particular center players wear custom-made mouth guards.

- Ankle Support

It is evident that ankle sprains are at least partially preventable when athletes use ankle braces, orthoses or taping as means of external protection. Especially, players with a history of ankle injuries should be advised to use external ankle support to prevent recurring injuries.

**4) Medical and non-medical support**

- Pre-Season Screenings

At least for professional athletes it is recommended to have a pre-season screening to detect potential risk factors for injuries, e.g. cardiovascular problems, muscular imbalances, athletic and neuromuscular deficits. Moreover performance diagnostics will help to identify better the athlete’s individual needs for a training programme to enhance the physical condition. If this is carried out under close supervision of coach and/ or physiotherapist this will contribute to increase overall performance and to reduce acute and chronic injuries.

**Conclusion**

- Athletic training contributes to performance enhancement as well as injury prevention. It is advised that training sessions should be tailored towards the prime interest of players in enhancing their athletic performance and thus indirectly helping them to prevent injuries.
- Associations and clubs should follow a pro-active strategy as to the risk of injury and communicate with members openly about risks involved and necessary measures to be taken by clubs and individuals.
- It is recommended to have all associations to include an injury prevention module in their trainer education curriculums.

**Acknowledgements & further Information**

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Detailed reports on all project parts (including references) are available for download at the project website [www.safetyinsports.eu](http://www.safetyinsports.eu)  
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