



This is a peer-reviewed, post-print (final draft post-refereeing) version of the following published document, The final publication is available at Springer via <http://dx.doi.org/10.1007/s42978-020-00075-0> and is licensed under All Rights Reserved license:

De Ste Croix, Mark B ORCID logoORCID: <https://orcid.org/0000-0001-9911-4355>, Ayala, Francisco ORCID logoORCID: <https://orcid.org/0000-0003-2210-7389>, Sanchez, S, Lehnert, Michal and Hughes, Jonathan ORCID logoORCID: <https://orcid.org/0000-0002-9905-8055> (2020) Grass-root coaches' knowledge, understanding, attitude and confidence to deliver injury prevention training in youth soccer: a comparison of coaches in three EU countries. *Journal of Science in Sport and Exercise*, 2. pp. 367-374. doi:10.1007/s42978-020-00075-0

Official URL: <https://link.springer.com/article/10.1007/s42978-020-00075-0>
DOI: <http://dx.doi.org/10.1007/s42978-020-00075-0>
EPrint URI: <https://eprints.glos.ac.uk/id/eprint/8601>

Disclaimer

The University of Gloucestershire has obtained warranties from all depositors as to their title in the material deposited and as to their right to deposit such material.

The University of Gloucestershire makes no representation or warranties of commercial utility, title, or fitness for a particular purpose or any other warranty, express or implied in respect of any material deposited.

The University of Gloucestershire makes no representation that the use of the materials will not infringe any patent, copyright, trademark or other property or proprietary rights.

The University of Gloucestershire accepts no liability for any infringement of intellectual property rights in any material deposited but will remove such material from public view pending investigation in the event of an allegation of any such infringement.

PLEASE SCROLL DOWN FOR TEXT.

Grass-root coaches knowledge, understanding, attitude and confidence to deliver injury prevention training in youth soccer: a comparison of coaches in three EU countries

Abstract

Purpose: It is well recognised that injury prevention training can reduce injury incidence, however current coach education pathways do not provide grass-root coaches with the knowledge and confidence to deliver such training to youth players. The aim of this study was to explore differences in knowledge, understanding, attitude and confidence to deliver such injury prevention training in three European countries.

Methods: A total of 269 grass-root soccer coaches from 3 European countries (UK, Spain, Czech Republic) were recruited for this study. A validated questionnaire exploring knowledge, understanding, attitude towards and confidence to deliver youth injury prevention training was completed prior to a 2hr workshop on injury prevention training. Differences between countries was examined using Bayesian factors to quantify the evidence for and against the hypothesis of independence (H_0) by assuming a Poisson sampling scheme (as there was no a priori restriction on any cell count, nor on the grand total) (BF_{10} Poisson).

Results: Current knowledge, attitude and confidence to deliver injury prevention training to youth players was poor across all three European countries. Relatively few coaches were currently using injury prevention training in their coaching sessions (23%). There were some country specific differences for attitude towards injury prevention training and confidence to deliver injury training, with Spanish coaches reporting a more positive attitude and confidence to deliver such training. Significantly fewer coaches in the UK were using injury prevention training compared to coaches in Spain and the Czech Republic.

Conclusion: As coaches identified a need for coach education and few were delivering injury prevention training, there is a clear need to embed and implement this programme into the grassroots coaching framework of sports governing bodies to improve adoption, implementation and maintenance.

Keywords: Youth, Injury prevention training, coach education, movement competency

INTRODUCTION:

It is well recognised that children aged between 12-18y-of-age are at the greatest risk of sustaining a serious non-contact injury that has both short and long-term health consequences (Rumpf and Cronin, 2014). Recent data suggest that the risk of paediatric sport injury is high and constitutes a significant public health burden (Marshall et al 2016). A number of recent economic cost analysis studies indicate that neuromuscular training reduces injury burden and economic and social costs associated with injury in youth sport (Rossler et al. 2019; Marshall et al. 2016). Indeed, the study of Rossler et al. (2019) reported that implementation of the FIFA11+Kids programme reduced healthcare costs by 51% compared to a traditional warm up providing compelling evidence for its widespread implementation.

Coaches play a major role in encouraging and ensuring that participants of their teams adopt appropriate safe practices (White et al, 2012). However, the extent to which coaches undertake this role is influenced by their knowledge, beliefs and attitude towards injury prevention programmes. Injury prevention programmes need to be age, sex and maturation specific with clear progressions as a child grows and matures. There is currently a need to develop such materials that are suitable for grass-root coaches. It is well recognised that coaches who uptake and adhere to such prevention programmes can reduce injury incidence in their youth athletes by up to 80% and one randomised control trial saw a 89% reduction in injury rates during just 1 season of the adoption of an injury prevention programme (Soligard et al. 2008). Alongside growing support for injury prevention programmes efficacy, evidence of significant challenges to implementing these programmes has emerged (O'Brien and Finch 2016). Thus, despite the well-recognised benefits of adopting an injury prevention programme, uptake, adherence and compliance are often poor (O'Brien and Finch 2016). This is concerning as high compliance has been associated with greater injury reductions. Coaches have been identified as important adoption targets for injury prevention programmes in amateur soccer but recent studies have identified low levels of amateur coaches using such programmes. Linked to these data are significant knowledge gaps amongst community level coaches regarding injury prevention programmes (McKay et al, 2014; Orr et al, 2013).

The few studies that have aimed to explore coach knowledge and current use of injury prevention programmes has identified that knowledge and use is generally low (Gebert et al. 2019; Mawson et al. 2018; Wilke et al. 2018). Mawson et al (2018) recently surveyed 101 Canadian youth soccer coaches and reported that injury prevention training was used by only 25% of coaches with those coaches who had attended more coaching courses more likely to use such training. Most coaches (84%) who were not using injury prevention training indicated that if they were more aware of the effectiveness of such training then they would be more likely to use it. The authors concluded that barriers to use of such training was a lack

of communication and education between the sporting organisations and the coaches (Mawson et al. 2018). In a nationwide study of use of injury prevention training in amateur soccer the number of teams using such training has not changed over 7 years (2008 = 21.7% and 2015 = 21.9%). However, awareness of such training does not always translate into practice as a study exploring awareness and use of the FIFA11+ in 1223 German amateur level football coaches (Wilke et al. 2018). In this study 43% of coaches were aware of the FIFA 11+ with only 31% using the programme. Children involved in talent development pathways often have access to sports science and medicine support at their clubs, however the majority of children participating in sport do so at the grassroots level and thus it is the local grassroots coach that holds the responsibility for the welfare of the youth players they coach.

Currently coach education and CPD for registered coaches across European nations are managed and delivered by the National associations/federations. National strategies will develop the generic awards and CPD for coaches who are then normally delivered by the regional associations, especially in football, and this is the case in the UK, Spain and Czech Republic. Currently there are CPD modules that focus on the youth soccer player but there are no CPD workshops or materials on youth injury prevention programmes linked to player well-being/welfare. Grass-root/community coaches do not have such support mechanisms even though player well-being forms a large part of their remit as the coach. The aim of this study was to compare the knowledge, attitude towards and confidence to deliver injury prevention training in grassroots soccer coaches in three European countries. We hypothesized that there would be no significant between country differences in knowledge, attitude towards and confidence to deliver injury prevention training in grass-root coaches due to the similar coach education pathways in each country and that none of the countries provide specific CPD workshops or materials on youth injury prevention.

METHODS

Two hundred and sixty-nine grass root coaches from three European countries (UK n = 68; Spain n = 90; Czech Republic n = 111) were invited (via regional football associations/federations) to attend a free 2hr workshop on injury prevention in youth soccer. The total sample consisted of 238 (88%) male and 31 (12%) female coaches. Inclusion criteria were: i) Participants needed to be aged 18 years or above; ii) were a licensed member of their countries National Football Association; iii) coached a youth football team; ii) were not coaching a semi/professional team. Coaches' knowledge of, attitude towards and confidence to deliver youth injury prevention as part of their coaching was explored at the start of the workshop via a questionnaire. Some questions required a yes/no answer and others were based on a 5-point likert-scale.

This paper-based survey was administered by the lead researchers to all course participants at the beginning of the workshop before any discussion regarding youth injury prevention.

Questionnaire Development

The questionnaires were compiled following the Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework (Glasgow et al. 1999) after a review of the wider coach education literature, and in collaboration with the three European partners of the project to ensure that any country specific issues were addressed. The framework has been most commonly applied as an evaluation tool but has broader application as a planning tool and as a method to review intervention studies (Finch 2011). The scales, items and concepts deployed were derived and adapted, in part, from the survey employed by O'Brien and Finch (2016) exploring the perceptions of the deliverers of injury prevention training in youth soccer. Following pilot testing, the final set of questions were developed and agreed upon through consultation between the authors, and football association/federation representatives. The first part of each questionnaire elicited demographic and background information from coaches including level of coaching qualification, sex, age group coached, number of years coaching. The second part of the questionnaire assessed 10 questions related to knowledge of injury prevention programmes, attitude towards injury prevention and confidence to deliver injury prevention. Perceived barriers and facilitators towards delivering such training was also explored. These were assessed both in terms of the relative level of importance attributed to each item (rated on a 5-point scale ranging from Strongly Agree (5) to Strongly Disagree (1)). The questionnaires were administered in the respective languages of the participating countries (questionnaires can be found in the supplementary materials).

Statistical analysis

Statistical analyses were performed using JASP (Amsterdam, Netherland) software version 0.10. For all analysis the null hypothesis assumed no significant difference would be observed between countries for knowledge, attitude and confidence to deliver injury prevention training. For each of the possible responses of the survey questions, the true and expected (supposing a priori that the null hypothesis were true [H_0 = variables are independent]) frequency of cases coded were calculated (both grouped and separately for country) through a R (rows = possible responses of the questions) x C (columns = country [Czech Republic, United Kingdom and Spain) Bayesian contingency table.

The Bayesian factor described by Gunel and Dickey (1974) (henceforth GD74) was used to quantify the evidence for and against the hypothesis of independence (H_0) in each of the survey questions and with regards to the three countries that took part in this study assuming a Poisson sampling scheme (as there was

no a priori restriction on any cell count, nor on the grand total) (BF_{10} Poisson). The expected frequency in each cell consists of the fully observed cases in the cell and the expected number of the partially observed cases that fall in the cell.

Despite the inherently continuous nature of the Bayes factor as a measure of evidential strength, Jeffreys (1961) and Lee & Wagenmakers (2014) proposed to categorize Bayes factors in the following discrete categories: $< 1/100$ = extreme evidence for H_0 , from $1/100$ to $< 1/30$ = very strong evidence for H_0 , from $1/30$ to $< 1/10$ = strong evidence for H_0 , from $1/10$ to $< 1/3$ = moderate evidence for H_0 , from $1/3$ to < 1 = anecdotal evidence for H_0 , from 1 to 3 = anecdotal evidence for H_1 , from >3 to 10 = moderate evidence for H_1 , from >10 to 30 = strong evidence for H_1 , from > 30 to 100 = very strong evidence for H_1 , > 100 = extreme evidence for H_1 .

RESULTS

Only 16% of coaches had heard of any type of injury prevention programme but 84% of the coaches acknowledged that they thought it was possible to prevent injuries in youth soccer with such training. Subsequently, all coaches (100%) acknowledged that injury prevention training was important for youth players and that coach education was needed for them to confidently deliver such training, but only 40% of coaches stated that they had a positive attitude towards injury prevention training. Only 59% of coaches consider that youth players are at high risk of injury to the lower limb and only the same amount consider that lower limb injuries in youth players can affect their current quality of life. Knowledge regarding injury prevention training was low with only 19% of coaches acknowledging any knowledge regarding this type of training. Only 25% of coaches felt confident to deliver injury prevention training with 23% of coaches currently delivering any form of injury prevention training into their coaching. 76% of coaches acknowledge that injury prevention training needs to be progressive and fun for grass-root players. 25% of coaches were currently implementing some injury prevention training into their coaching sessions with youth footballers. Statistical analysis exploring country specific differences regarding use of injury prevention programmes, knowledge of injury prevention programmes, attitude towards such programmes and confidence to deliver youth injury prevention training can be found in the following section.

Do you use an injury prevention programme currently in your sessions?

Table 1 reports that a relatively high percentage of the European grass-root coaches surveyed (74.8%) were not delivering any form of injury prevention training into their coaching. Furthermore, the statistical analysis conducted showed that there is extreme evidence (BF_{10} Poisson = 185.4) in favor of the alternative hypothesis so that a relationship of dependency between the responses to the question 1 indicates that country differences exist. The proportion of coaches from the Czech Republic that are currently

delivering any form of injury prevention training (33.9%) is higher than that observed in Spanish coaches (25.2%) and much higher than the proportion of coaches from the United Kingdom (8.9%).

Table 1

Bayesian contingency table 1: Do you use an injury prevention programme currently in your sessions?

Possible answers	Country			Total
	Czech Republic	United Kingdom	Spain	
Yes				
▪ N° cases	38	6	20	64
▪ Proportion column (%)	33.9	8.9	25.2	25.2
▪ N° cases expected	28	17	27	64
No				
▪ N° cases	74	61	55	190
▪ Proportion column (%)	66.1	91.1	73	74.8
▪ N° cases expected	84	50	56	190
Total				
▪ N° cases	112	67	75	254
▪ Proportion column (%)	100	100	100	100
▪ N° cases expected	112	67	75	254

BF₁₀ Poisson = 185.4 (extreme evidence for H₁) (grouped data)

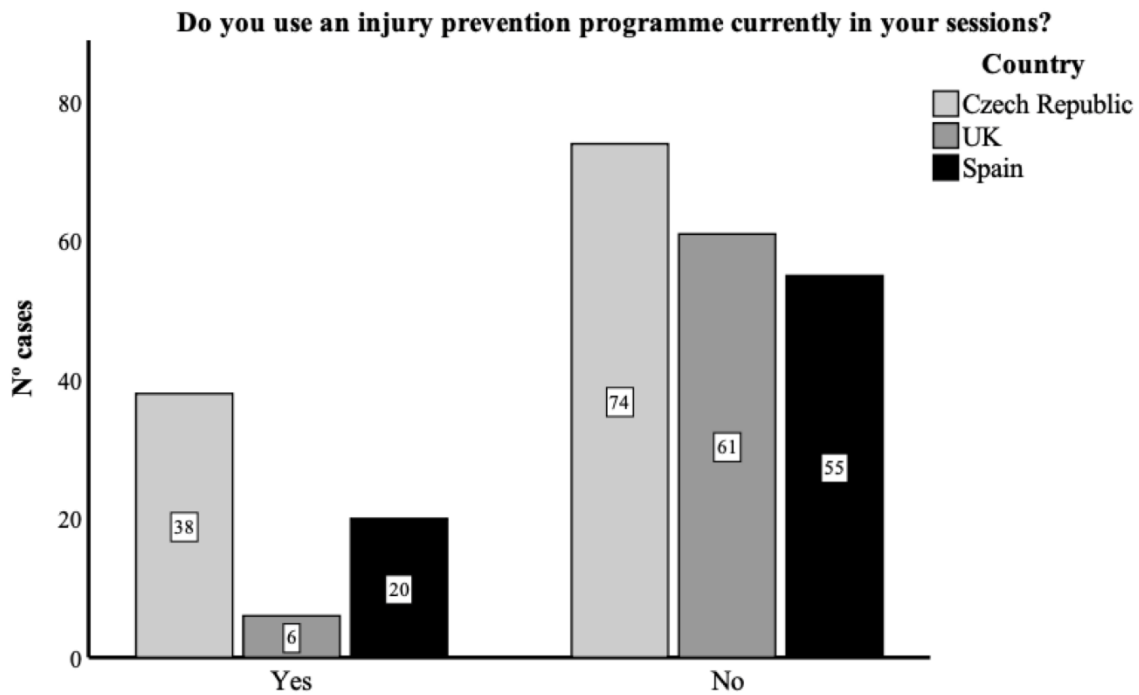


Figure 1

Question 2: My knowledge of injury prevention issues before the workshop was

Table 2 indicates that current knowledge regarding injury prevention for youth sport is very low with only 19% of European grass-root coaches surveyed reporting good (16%) or very good (3%) knowledge.

Furthermore, the statistical analysis indicated that there is anecdotal evidence (BF_{10} Poisson = 0.116) in favor of the alternative hypothesis so that a relationship of dependency between the responses to the question 2 for country does not exist. For example, the proportion of coaches reporting good or very good knowledge in the Czech Republic (16.3%) Spain (22.2%) and United Kingdom (17.4%) were similar.

Table 2

Bayesian contingency table 2: My knowledge of injury prevention issues before the workshop was

Possible answers	Country			Total
	Czech Republic	United Kingdom	Spain	
Very poor				
▪ N° cases	6	8	4	18
▪ Proportion column (%)	5.5	11.6	4.4	6.8
▪ N° cases expected	7	5	6	18
Poor				
▪ N° cases	43	25	24	92
▪ Proportion column (%)	39.1	36.2	26.7	34.2
▪ N° cases expected	38	24	30	92
Not good / Not poor				
▪ N° cases	43	24	42	109
▪ Proportion column (%)	39.1	34.8	46.7	40.5
▪ N° cases expected	45	28	37	109
Good				
▪ N° cases	13	10	19	42
▪ Proportion column (%)	11.8	14.5	21.1	15.6
▪ N° cases expected	17	11	14	42
Very good				
▪ N° cases	5	2	1	8
▪ Proportion column (%)	4.5	2.9	1.1	3
▪ N° cases expected	3	2	3	8
Total				
▪ N° cases	110	69	90	269
▪ Proportion column (%)	100	100	100	100
▪ N° cases expected	110	69	90	

BF_{10} Poisson = 0.116 (anecdotal evidence for H_0) (grouped data)

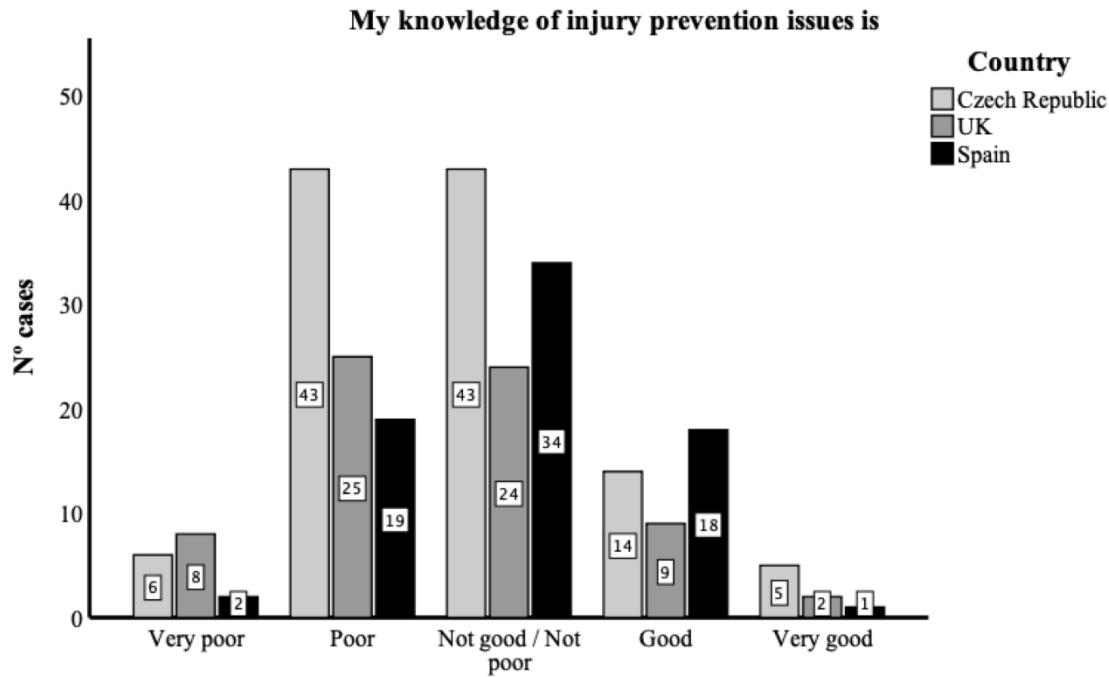


Figure 2

Question 3: My attitude toward injury prevention before the workshop was

Table 3 reports that a just over a third of European grass-root coaches surveyed (39.8%) had a positive attitude towards injury prevention training. Statistical analysis indicated that there is extreme evidence (BF_{10} Poisson = 1329.9) in favor of the alternative hypothesis so that a relationship of dependency between the responses to the question 3 and country does exist. In this case Spanish coaches had a better attitude towards injury prevention training than Czech (26.4%) and UK (37.7%) coaches.

Table 3

Bayesian contingency table 3: My attitude toward injury prevention before the workshop was

Possible answers	Country			Total
	Czech Republic	United Kingdom	Spain	
Indifferent				
▪ N° cases	3	2	1	6
▪ Proportion column (%)	2.7	2.9	1.1	2.3
▪ N° cases expected	3	1	2	6
2				
▪ N° cases	23	15	4	42
▪ Proportion column (%)	20.9	21.7	4.4	15.6
▪ N° cases expected	17	11	14	42
3				
▪ N° cases	55	26	33	114
▪ Proportion column (%)	50	37.7	36.7	42.4
▪ N° cases expected	47	29	38	114

4				
▪	N° cases	18	16	26
▪	Proportion column (%)	16.4	23.2	28.9
▪	N° cases expected	25	15	20
Sympathetic				
▪	N° cases	11	10	26
▪	Proportion column (%)	10	14.5	28.9
▪	N° cases expected	19	12	16
Total				
▪	N° cases	110	69	90
▪	Proportion column (%)	100	100	100
▪	N° cases expected	110	69	90

BF_{10} Poisson = 1329.9 (extreme evidence for H_1) (grouped data)

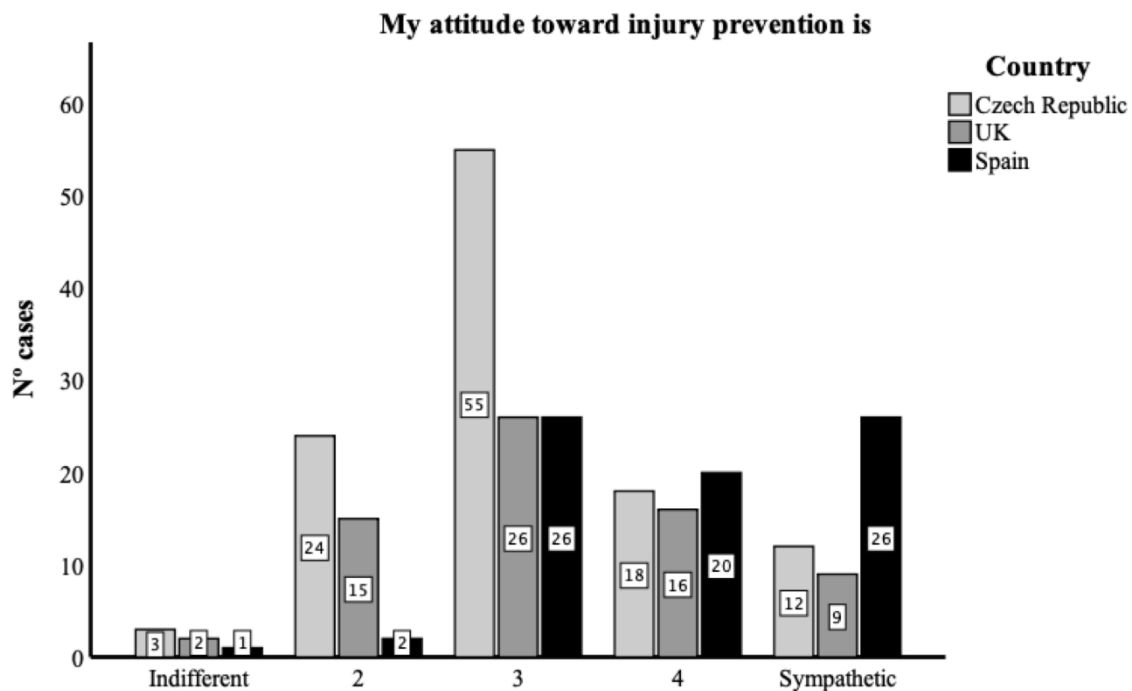


Figure 3

Question 4: How would you rate your confidence to deliver an injury prevention programme?

Table 4 indicates that about a quarter of European grass-root coaches surveyed (24.8%) were confident to deliver injury prevention training into their coaching. Statistical analysis showed that there is strong evidence (BF_{10} Poisson = 26.8) in favor of the alternative hypothesis indicating a relationship of dependency between

the responses to the question 4 and country exists. Spanish coaches (37.3%) were more confident than both Czech (20%) and UK (15.9) coaches to deliver injury prevention training to youth athletes.

Table 4

Bayesian contingency table 4: My confidence to deliver injury prevention before the workshop was

Possible answers	Country			Total
	Czech Republic	United Kingdom	Spain	
Very low				
▪ N° cases	12	18	8	38
▪ Proportion column (%)	10.9	26.1	8.8	14.1
▪ N° cases expected	15	10	13	38
Low				
▪ N° cases	40	24	23	87
▪ Proportion column (%)	36.4	34.8	25.3	32.2
▪ N° cases expected	36	22	29	87
Not low / not high				
▪ N° cases	36	16	26	78
▪ Proportion column (%)	32.7	23.2	28.6	28.9
▪ N° cases expected	32	20	26	78
High				
▪ N° cases	18	6	15	39
▪ Proportion column (%)	16.4	8.7	16.5	14.4
▪ N° cases expected	16	10	13	39
Very high				
▪ N° cases	4	5	19	28
▪ Proportion column (%)	3.6	7.2	20.8	10.4
▪ N° cases expected	12	7	9	28
Total				
▪ N° cases	110	69	91	270
▪ Proportion (%)	100	100	100	100
▪ N° cases expected	110	69	91	270

BF₁₀ Poisson = 26.8 (Strong evidence for H₁) (grouped data)

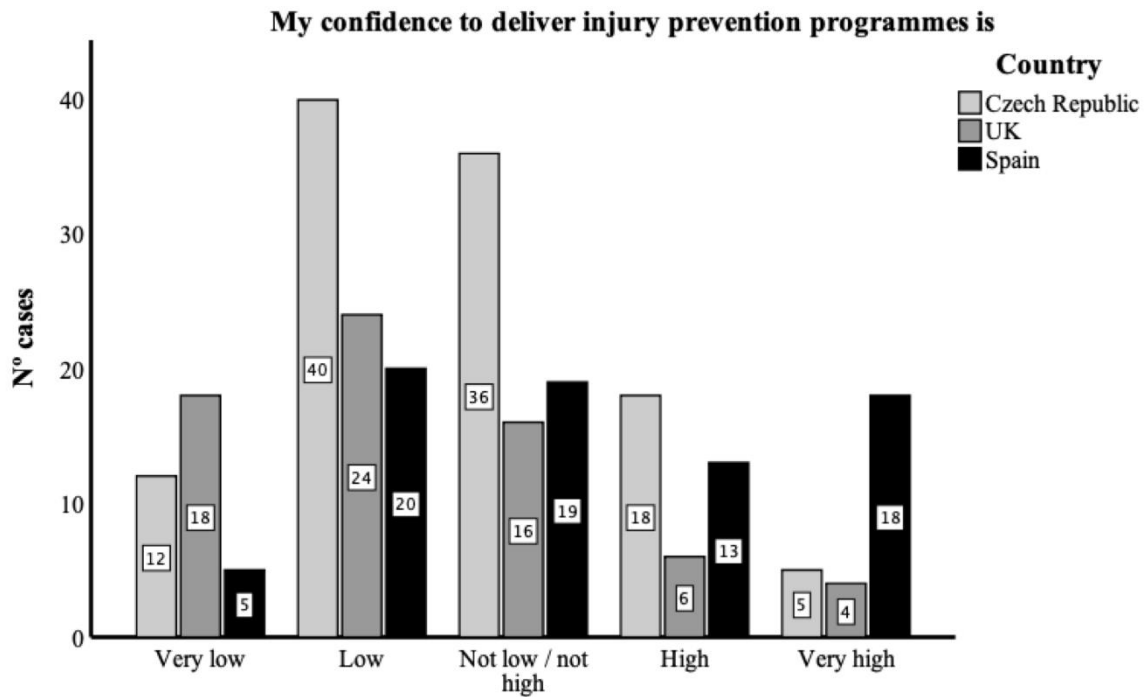


Figure 4

DISCUSSION

The findings of the current study indicate that grassroots soccer coaches knowledge and confidence to deliver injury prevention training to youth players is generally poor irrespective of the European country where the coach education has been delivered. There is a slightly better attitude towards this type of training with around half of all coaches indicating a positive attitude towards injury prevention training. This is supported by the fact that all coaches (100%) felt that this type of training was important for preventing injuries in youth players. Despite this only a small proportion (23%) were currently including injury prevention training into their coaching practice. This finding is in agreement with the previous work of Frank et al (2014) who reported high levels of acknowledgement that injury prevention training could enhance athletic performance and reduce injury risk in youth athletes but despite behavioural intention to include such activities into their coaching, adoption and implementation levels are low. This is surprising when it is well recognised from recent systematic reviews that neuromuscular intervention programmes are effective in reducing injury rates in youth sport (Emery et al., 2019; Hanlon et al., 2020; Rossler et al. 2019). However, as Emery and colleague point out there is an ongoing concern regarding the uptake and maintenance of such programmes, which may be attributed to coach knowledge, understanding and attitude towards such interventions. In the current study the number of coaches currently using some form of injury prevention programme in their coaching (25%) is in line with previous studies on youth football coaches, which range from 22-31% (Mawson et al., 2018; Wilke et al., 2018; Gebert et al. 2017; O'Brien and Finch, 2016, 2017).

Given that all of the coaches (100%) felt that injury prevention is important for youth athletes it seems somewhat strange that current football coach education in the 3 European countries do not provide coaches with the knowledge and confidence to deliver such training. Others have also identified that coaches acknowledge the importance for such programmes (86%) without subsequent compliance/implementation (Gebert et al. 2019). In part this is probably due to the high demands placed on grass root coaches despite their often 'volunteer' status and the need to upskill in a wide range of areas that includes tactical/technical components as well as issues surrounding safeguarding physical and psychological development. It has also been suggested that low frequency of training sessions (Hammes et al., 2015) and coach knowledge (Junge et al. 2011) possibly influence the implementation of such programmes. Given the limited time on coach education courses it may be necessary for governing bodies to include this type of training as a compulsory CPD activity to add to the welfare agenda of the youth soccer player.

Overall knowledge regarding injury prevention training was low (19%) and there were no differences in knowledge between countries. This most likely relates to the previous comment regarding the lack of time to deliver such knowledge to coaches within the limited timeframe that grass-root coach education awards contain (approximately 45hrs in UK, 455hrs in Spain and 80hrs in Czech Republic for a level 1 coaching award). In a recent study by Mawson et al. (2018) with Canadian soccer coaches, one third of coaches acknowledged that risk of injury and prevention had been discussed in their coaching courses, but this study included coaches across all levels. It is likely that a lack of knowledge surrounding the benefits of injury prevention training, alongside a lack of knowledge regarding types of injury prevention programmes (only 16% had knowledge of any injury prevention programmes in the current study) probably contributes to the lack of translation of intent into practice. This has previously been identified in the study of Frank et al (2015) where poor knowledge translated into a lack of confidence to deliver such training and was thus seen as a major barrier to adoption, implementation and maintenance. It is therefore important that coaching courses introduce injury risk and prevention at the grassroots level to provide coaches with the knowledge and confidence to deliver such programmes.

Despite a lack of knowledge regarding injury prevention training nearly 40% of coaches had a positive attitude towards including this type of training into their coaching. Most of the other coaches had a neutral attitude towards such training (rather than a negative attitude) which is probably reflective of a lack of knowledge surrounding the subject area. Country specific differences were observed regarding attitude to such training with Spanish coaches demonstrating a more positive attitude than coaches in the UK and Czech Republic (58% vs 36% and 26% respectively). This difference may be reflective of the nature of grassroots coach set ups in the respective countries with the UK having more 'volunteer' coaches at these levels and Spanish coaches being more aligned to professional clubs at these levels. Indeed, coaches in Spanish

grassroot clubs are usually qualified to UEFA B level (level 1 coaching award totalling 455hr) as opposed to those level 1 coaches in the UK (43hr total qualification time) and Czech republic (80hr total qualification time). This greater alignment to professional environments and coach education time, where knowledge around injury prevention is likely greater, may account in part for this country specific difference.

Overall only a quarter of coaches (25%) felt confident to deliver injury prevention training but there were significant differences between countries with Spanish coaches more confident than coaches in the UK and Czech Republic. This again may be reflective of the structural alignment of grassroots coaches to more professional environments in Spain and a more 'volunteer' status in the UK and Czech Republic. Only 14% of coaches in the UK felt confident to include injury prevention training into their coaching and this reflects the lack of knowledge provided by the current coach education pathway. Our findings, indicating that a quarter of coaches were confident to deliver such training, is lower than that reported in a small number of female youth coaches (Frank et al., 2015). Frank et al. (2015) reported that 41% of female coaches felt comfortable in leading an injury prevention element in their coaching session. This perceived behavioural control has been shown to be important for adoption and implementation as heightened levels of intent are needed for behavioural change to take place. Previous studies have indicated that behavioural intent is the strongest predictor of behavioural change (Ajzen, 1991). In Spain although over a third of coaches (37%) felt confident to deliver injury prevention training only about a fifth (22%) were delivering such training. These data are in line with previous studies that have also reported higher levels of confidence or intent to deliver compared to those implementing such training (Wilke et al., 2018). For example, Frank et al (2015) reported that 88% of coaches demonstrated intent to include injury prevention into their coaching but only 53% actually implement the training. Further investigation is required to elucidate why coaches with the confidence to deliver are not implementing this into their coaching practice. A specific study in Spain exploring barriers and facilitators to implementation, using mixed methods approaches is therefore warranted.

There were significantly more coaches in both Spain and the Czech Republic using injury prevention programmes than coaches in the UK (22% and 37% vs 9%). The low levels of coach implementation in all countries is of concern but is especially worrying in the UK. Interestingly in the Czech republic 37% of coaches were using injury prevention training but only 16% felt they had the knowledge to do so and only 19% felt confident enough to deliver such training. It is somewhat concerning that such training is being delivered without the knowledge to ensure that training is age, maturation and sex appropriate and that progressions are appropriate. Further coach education in the Czech Republic is required to make sure that implementation, under the RE-AIM framework is underpinned by robust knowledge that is paediatric specific in order to safeguard players who are in the care of coaches during training and matches.

The findings of the current study reinforce the need that a key focus of must be placed upon coach education to ensure effective adoption and implementation via developing knowledge, changing attitudes and behaviours, especially in those coaches who are early in their coaching careers. There is clearly a need to embed movement competency training in level 1 and 2 of the coach education pathway, with appropriate resources to support knowledge gain that can be achieved via the dedicated workshops. This will aid grassroots coaches in adopting, implementing and maintaining movement competency training to promote lifelong habits in the children they coach. It is important to note that recent research has identified that positive attitudes and beliefs, and intent to implement, do not necessarily translate to coaching practice (Frank et al. 2015) without role modelling from both organisations and at club level. It has also been recognised in elite sporting environments that the leadership style of the coach in terms of attitude towards injury prevention is vital in the success of reducing injury incidence (Ekstrand et al. 2018). Studies are needed that explore the effectiveness of such coach education programmes to increase knowledge and change attitudes towards such training so that it is adopted, implemented correctly and importantly maintained. It is also important to also explore potential perceived and actual facilitators and barriers to adoption, implementation and maintenance.

CONCLUSION

As all coaches identified a need for coach education and few were delivering injury prevention training, there is a clear need to embed and implement this programme into the grassroots coaching framework of sports governing bodies. These findings reinforce that the current coach education programmes do not provide grassroots coaches across the 3 European countries with the knowledge and confidence to deliver injury prevention training. In those countries where there is already some knowledge around injury prevention training but little implementation, federations and governing bodies need to reassess the delivery of such knowledge as this is not translating into changing practice.

Conflict of interest statement: On behalf of all authors, the corresponding author states that there is no conflict of interest.

REFERENCES:

Ajzen I. The theory of planned behavior. *Organizational behavior and human decision processes*. Organ Behav Hum 1991; 50:179–211.

Ekstrand J, Lundqvist D, Lagerbäck L, Vouillamoz M, Papadimitiou N, Karlsson J. Is there a correlation between coaches' leadership styles and injuries in elite football teams? A study of 36 elite teams in 17 countries. *Br J Sports Med.* 2018 Apr 1;52(8):527-31.

Emery CA, van den Berg C, Richmond SA, Palacios-Derflingher L, McKay CD, Doyle-Baker PK, McKinlay M, Toomey CM, Nettel-Aguirre A, Verhagen E, Belton K. Implementing a junior high school-based programme to reduce sports injuries through neuromuscular training (iSPRINT): a cluster randomised controlled trial (RCT). *British journal of sports medicine.* 2019 Dec 10.

Finch CF. No longer lost in translation: the art and science of sports injury prevention implementation research. *British journal of sports medicine.* 2011 Dec 1;45(16):1253-7.

Frank BS, Register-Mihalik J, Padua DA. High levels of coach intent to integrate a ACL injury prevention program into training does not translate to effective implementation. *Journal of science and medicine in sport.* 2015 Jul 1;18(4):400-6.

Gebert A, Gerber M, Pühse U, Stamm H, Lamprecht M. Injury prevention in amateur soccer: a nation-wide study on implementation and associations with injury incidence. *International journal of environmental research and public health.* 2019 Jan;16(9):1593.

Gebert A, Lamprecht M, Wiegand D, Stamm H. Prevention in youth sports: evaluation and implementation of the "cool and clean" prevention programme by coaches. *Prävention und Gesundheitsförderung.* 2017;12(2):125-31.

Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *American journal of public health.* 1999 Sep;89(9):1322-7.

Gunel E, Dickey J. Bayes factors for independence in contingency tables. *Biometrika.* 1974 Dec 1;61(3):545-57.

Hammes D, Aus der Fünten K, Kaiser S, Frisen E, Bizzini M, Meyer T. Injury prevention in male veteran football players—a randomised controlled trial using “FIFA 11+”. *Journal of sports sciences*. 2015 May 28;33(9):873-81.

Hanlon C, Krzak JJ, Prodoehl J, Hall KD. Effect of injury prevention programs on lower extremity performance in youth athletes: a systematic review. *Sports health*. 2020 Jan;12(1):12-22.

Jeffreys, H. (1961). *Theory of probability*. Oxford: Oxford University Press.

Junge A, Lamprecht M, Stamm H, Hasler H, Bizzini M, Tschopp M, Reuter H, Wyss H, Chilvers C, Dvorak J. Countrywide campaign to prevent soccer injuries in Swiss amateur players. *The American journal of sports medicine*. 2011 Jan;39(1):57-63.

Lee MD, Wagenmakers EJ. *Bayesian cognitive modeling: A practical course*. Cambridge university press; 2014 Apr 3.

Marshall DA, Lopatina E, Lacny S. and Emery CA. 2016. Economic impact study: neuromuscular training reduces the burden of injuries and costs compared to standard warm-up in youth soccer. *Br J Sports Med*, 50(22), pp.1388-1393.

Mawson R, Creech MJ, Peterson DC, Farrokhyar F, Ayeni OR. Lower limb injury prevention programs in youth soccer: a survey of coach knowledge, usage, and barriers. *Journal of experimental orthopaedics*. 2018 Dec 1;5(1):43.

McKay CD, Steffen K, Romiti M, Finch CF, Emery CA. The effect of coach and player injury knowledge, attitudes and beliefs on adherence to the FIFA 11+ programme in female youth soccer. *Br J Sports Med*. 2014 Sep 1;48(17):1281-6.

O'Brien J, Finch CF. Injury prevention exercise programmes in professional youth soccer: understanding the perceptions of programme deliverers. *BMJ open sport & exercise medicine*. 2016 Jan 1;2(1):e000075.

O'Brien J, Finch CF. Injury prevention exercise programs for professional soccer: understanding the perceptions of the end-users. *Clinical journal of sport medicine*. 2017 Jan 1;27(1):1-9.

Orr B, Brown C, Hemsing J, McCormick T, Pound S, Otto D, Emery CA, Beaupre LA. Female soccer knee injury: observed knowledge gaps in injury prevention among players/parents/coaches and current evidence (the KNOW study). *Scandinavian journal of medicine & science in sports*. 2013 Jun;23(3):271-80.

Rössler R, Verhagen E, Rommers N, Dvorak J, Junge A, Lichtenstein E, Donath L, Faude O. Comparison of the '11+ Kids' injury prevention programme and a regular warmup in children's football (soccer): a cost effectiveness analysis. *Br J Sports Med*. 2019 Mar 1;53(5):309-14.

Rössler R, Donath L, Verhagen E, Junge A, Schweizer T, Faude O. Exercise-based injury prevention in child and adolescent sport: a systematic review and meta-analysis. *Sports medicine*. 2014 Dec 1;44(12):1733-48.

Rumpf MC, Cronin J. Injury incidence, body site, and severity in soccer players aged 6–18 years: implications for injury prevention. *Strength & Conditioning Journal*. 2012 Feb 1;34(1):20-31.

Soligard T, Myklebust G, Steffen K, Holme I, Silvers H, Bizzini M, Junge A, Dvorak J, Bahr R, Andersen TE. Comprehensive warm-up programme to prevent injuries in young female footballers: cluster randomised controlled trial. *Bmj*. 2008 Dec 10;337:a2469.

White PE, Ullah S, Donaldson A, Otago L, Saunders N, Romiti M, Finch CF. Encouraging junior community netball players to learn correct safe landing technique. *Journal of Science and Medicine in Sport*. 2012 Jan 1;15(1):19-24.

Wilke J, Niederer D, Vogt L, Banzer W. Head coaches' attitudes towards injury prevention and use of related methods in professional basketball: A survey. *Physical therapy in sport*. 2018 Jul 1;32:133-9.

Acknowledgement:

This study was funded by a European Union research grant: Erasmus+ 2016-2602

“The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.”

