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Coaches' perceptions on the *Spread*: a 1 vs 1 goalkeeper technique. International survey on 400+ goalkeeper coaches

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A. Title page

TITLE:

Coaches' perceptions on the *Spread*: a 1 vs 1 goalkeeper technique. International survey on 400+ goalkeeper coaches

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Coaches' perceptions on the *Spread*: a 1 vs 1 goalkeeper technique. International survey on 400+ goalkeeper coaches

A. Abstract

In this study, we explore goalkeeper (GK) coaches' knowledge and use of the *Spread*, a 1v1 goalkeeping technique, and their experiences and perceptions on injury risks related to it. An online questionnaire was distributed internationally between January and March 2023, collecting a total of 411 complete answers (largest sample of GK-coaches to date). GK coaches' demographics were used to explore significant differences between answers. Almost all coaches recognized (99%) and used (78%) the technique. Coaches recommended to start training the *Spread* from a *Recreational* level and at an age of 11.3 ± 2.8. *Contact with another player* was the most (67%) perceived type of injury risk; 38% of the coaches recalled at least one player getting injured performing the *Spread* (*Elite* level coaches significantly more likely, p<.01); with *Contusion* (16.3%) and *Musculo-skeletal* (15.8%) being the most recalled type of injuries. Most coaches perceived no injury risk differences between male and female GK (68.1%), nor between young and adult GK (41.1%). These results show the *Spread's* popularity among GK coaches while highlighting knowledge gaps in some areas (e.g., technical execution, sources of knowledge). Both researchers and stakeholders can leverage from the results to develop and improve GK-coaching interventions, particularly in the field of injury prevention.

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1. Introduction

The goalkeeper (GK) is only one of the eleven players that each football team has on the field, but the rules[1] and game dynamics make it a special position.[2] Compared to field players, GKs have significantly different anthropometrics and performances in physiological tests [3,4]; as well as typically being one position with a dedicated coach (also known as "specialist coach").[5] As highlighted in some recent reviews on the GK position, most football research has focused on the team as a whole, ignoring this specificity as a consecuence.[4,6–8] Some GK-focused studies have covered the distance and speed distribution during the game [9–13], and training.[10,11,13] While it seems that most high-intensity actions occur when the GK's team does not have possession of the ball, [4,6–8,14] a lack of consistency between studies results in most of them simply being labeled as "saves" or "explosive efforts".[10,11,13] Apart from the (lateral) diving save [15–19], for which recommendations have recently been published to increase performance [20–23], not much is known about the remaining techniques used by GKs. One study with a comprehensive analysis of the GK actions in elite level matches concluded that *one on one* situations (1v1) were the most complex, game-deciding defensive techniques, where most goals and GK mistakes occurred.[24] A few studies have analyzed the performance in these 1v1 events, covering the role of interpersonal dynamics, as well as informational constraints, interpersonal distance and relative velocity.[25,26] Others have used Machine Learning to identify and classify the different 1v1 techniques based on similarity and effectivity.[27] The relevance of these situations seems to be known by GK coaches, who highlighted 1v1 techniques during a series of interviews.[28] References to this type of action can also be found in specialized media and GK coaching resources.[29–33]

To the best of our knowledge, no previous research has been published on the subject of GKs' injury risk in 1v1 events. As highlighted recently[34], this situations can be related some injury risks since they

involve dynamic movements performed at high speeds and wide ranges of motion, which might lead to an overextension; or could end in collision with another player or the ball, due to the vulnerability of the GK while approaching the opposing player at high speed.[34–36] Among the French-speaking football community, a specific 1v1 technique, commonly known as "La Croix", has received attention from GK coaches and GK coaching associations.[37–39] Some English-speaking coaches refer to it as the "Spread" or "block" technique (further referred as *Spread*), buts no written reference was found in the literature, including some recently published GK coaching manuals.[40–43] This technique aims to protect the goal by occupying as much space as possible when the GK is the only defender left and faces an opponent facing the goal inside the penalty area. To do so, the knee of the leg closest to the nearest goal post is flexed and brought as close to the ground as possible, while keeping the shank parallel to ground. The other leg is fully extended, aiming to cover the maximum space towards the furthest goal post. Simultaneously, the trunk remains straight, and the arms are fully extended perpendicularly. This definition, however, is not entirely shared by all GK coaches and some execution differences might be seen from one player to another (see Figure 1 for one of its variations).

Figure 1. A goalkeeper performing the Spread technique.

Although a need for more relevant research for the GK position has been expressed [4,6–8], it is as important that it is conducted with the collaboration of coaches.[44] While there is reason to believe in the important role that 1v1 actions have for the position, there seems to be a lack of research to support it. Because of that, an exploratory study was designed to provide further insight on the *Spread* technique. A survey for GK coaches was developed with the aims of (a) exploring the knowledge and use by GK coaches of the *Spread*; and (b) assessing their experiences and perceptions on injury risks related to it.

2. Materials & methods

Questionnaire development

The questionnaire was developed by a multidisciplinary team of researchers and an experienced GK coach. The Checklist for Reporting Results of Internet E-Surveys (CHERRIES)[45], was used during the development phase and is available in the supplementary material (S4). The final draft was tested with three GK coaches from different levels, who completed it without reporting any difficulties. The questionnaire was originally developed in French, and later translated to English and Spanish by native speakers. An online platform (*sondageonline.com*) was used for collecting answers anonymously and

on a voluntary basis. An explanation of the aims of the questionnaire; the use of anonymized data for research purposes; and the opt-in option to receive the results was included at the beginning of the questionnaire. The study was performed in accordance with the principles stated in the Declaration of Helsinki. No ethics approval was requested due to the nature of the study (i.e., survey).

Questionnaire structure

The questionnaire consisted of either closed-ended multiple choice or Likert-scale type of questions divided into three sections: (1) Coach profile (2) Knowledge & use of the *Spread* (3) perceived injury risk from using the *Spread*. The full questionnaire can be found in the supplementary material (S1 and S2, for the original French version and the English translation, respectively).

Part I: Coach profile

Coaches were asked about their age, gender, and if they were GK coaches. If so, they were further asked about their coaching experience; number of coaching hours per week; team they trained (men/women/both); mean age of the players they coached; level of GK-specific courses that they had previously attended (*International > National > Local > None*); and self-rated competition level they coached at (*Elite > Sub-elite > Recreational)*. When more than one option was selected in the last two questions, the higher rank was used for analysis. Three additional questions unrelated to the *Spread* were included but are not discussed in this article.

Part II: Knowledge & use of the *Spread*

Based on a dynamic image (see S1.3 or S2.3), coaches were asked if they knew and coached the *Spread*; where did they learn the technique; their recommended age and level to start training it; whether or not there are different ways to perform it; how important was it that their players mastered it; the physical and psychological requirements to perform it, and the possible errors when performing it.

Part III: Perceived injury associations risks

Coaches were asked if they perceived a risk of injury related to the *Spread* and, if they did, the type of risk they perceived; if any of their coached players had been injured performing the *Spread*; and if they considered any injury risk differences between adult and youth players, and/or men and women GKs.

Participants

Snowball sampling was used to reach as many participants as possible.[46] The questionnaire link was shared via email and social media by the authors and several collaboration partners (see Acknowledgments section below). The questionnaire was available for response from January until March of 2023. GK coaches with at least one year of experience and at least 18 years of age were eligible for inclusion.

Answers from coaches who did not know the *Spread* were excluded from the analysis of the rest of the questions about it. Answers from coaches who did not coach the *Spread* to their players were excluded from the analysis for the two questions exploring coaches' experiences (i.e., importance of mastering the *Spread*, from Part II; and whether one of their players had been injured performing the *Spread*, from Part III).

Data treatment and statistical analysis

The original raw data was exported from the online platform and analyzed using JAPS v0.17.3 [47] and R v4.2.3 [48].

Descriptive analysis was performed for every question, comprised of means and standard deviation for numerical variables, and frequencies and total percentage for categorical variables.

GK coaches' age and experience; coached competition level; and GK courses previously attended; were statistically analyzed to observe the influence on the collected answers in Part II and III. Additional comparisons were made for GK-coaches' perceived injury risk differences between GK's sex (against coached team's sex), and between young and adult GK's (against averaged coached players' age).

Chi-Squared test was used between categorical variables; Pearson's correlation between numerical variables; and T-Test or one-way ANOVA (followed by post-hoc test with Tukey's correction) between numerical and categorical variables. Non-parametric alternatives (i.e., Mann-Whitney U test instead of T-Test, and Kruskal-Wallis instead of ANOVA) were used for non-normally distributed numerical variables (failed Shapiro-Wilk test). Significance level was set at $p < .05$.

3. Results

A total of 801 individual answers were registered in the survey platform, from which 466 (58.2%) were complete answers. After checking for inclusion criteria and erroneous answers, 411 (88.8%) were kept for further analysis. Table 1 shows the demographic data of the GK-coaches included.

Table 1. Summary of coaches' demographics

Variable	Mean ± SD	*n* (% of total)
Coach gender		
Men		404 (98.3%)
Women		7 (1.7%)
Coach age (yrs.)	40.8 ± 10.8	
Coaching experience. (yrs.)	11.5 ± 8.1	
Coaching hours per week	8.4 ± 7.1	
Average coached player's age (yrs.)	18.8 ± 4.9	
Coached team's sex		
Men's team		277 (67%)
Women's team		23 (6%)
Both		111 (27%)
GK-courses previously attended		
International		139 (33.8%)
National		146 (35.5%)
Local		50 (12.2%)
None		76 (18.5%)
Coached competition level		

Elite	249 (60.5%)
Sub-elite	89 (21.7%)
Recreational	73 (17.8%)

Knowledge & use of the *Spread*

Only 4 coaches (0.97%) reported not knowing the Spread. Figure 2 shows the source of knowledge of the *Spread*. No significant differences were found for level of GK-courses previously attended nor coached competition level. To the question on whether they knew if the Spread was taught in GK-courses, 184 (44.8%) answered "*yes*", 141 (34.3%) "*no*", and 86 (20.9%) "*I don't know*".

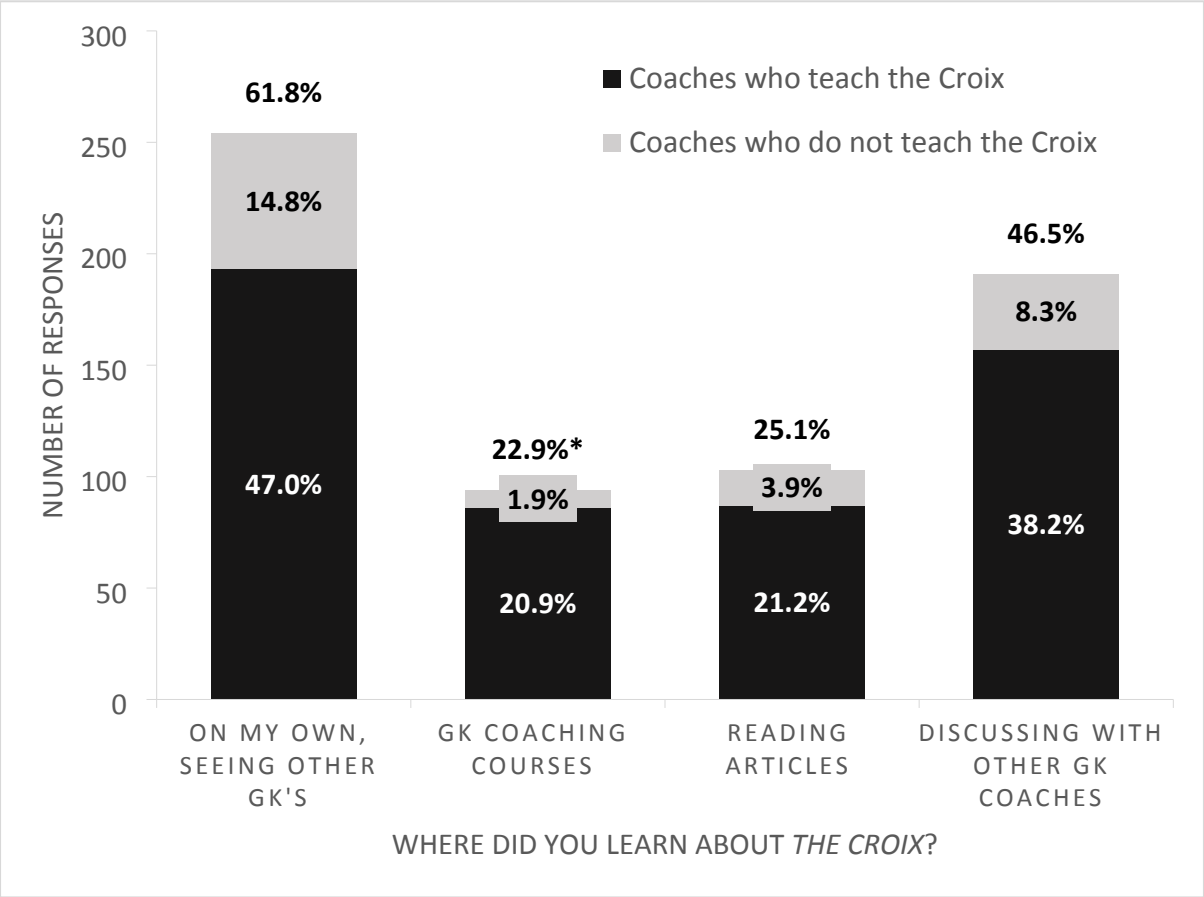

Figure 2. Coaches source of knowledge of the Croix technique. Multiple answers were allowed. GK: Goalkeeper
**GK-coaches who learnt the Croix in "GK coaching courses" were significantly more likely to teach it than those who did not.*

On the coaches' use of the *Spread* technique, 320 (78%) reported teaching it to their players, while 91 (22%) did not. Coaches that had learnt the *Spread* in GK courses, were found significantly more likely ($p = 0.0012$) to teach it than those who had not. No significant differences were found for level of GK courses previously attended nor coached competition level.

Recommended mean GK's age to start training it was 11.3 yrs. (± 2.8), with 21 (5.1%) coaches not considering there was such an age. The most recommended competing level to start training the *Spread* was *Recreational* (192, 47 %), followed by *Sub-Elite* (121, 29 %), and *Elite* (52, 13 %); with 46 (11 %) coaches not recommending any specific level. Coaches from the *Elite* competing group were significantly ($p < .05$) more likely to recommend their own level (i.e., *Elite*) and less likely to recommend *Recreational*. Coaches from the *Recreational* level and those who had not attended any GK-specific courses differences were significantly more likely to answer *Recreational* as the

recommended starting level. Standardized residuals and equivalent p values are shown in the *Supplementary Materials* (Table S3).

Mean agreement (0 = completely disagree, 100 = completely agree) on whether there is a single or several ways to perform the *Spread* was 38.9 (± 29.0). Among coaches who trained the *Spread,* mean agreement on whether their coached GKs should master it was 63.9 (± 27.4). No significant differences ($p > .05$) between levels of coached competition nor GK-specific courses previously attended were found for any of these questions.

Likert-scale answers on the physical and mental qualities, and the possible errors related to the *Spread* are shown in Figure 3. All mental and physical qualities were rated as *important*, to some level, by more than 90% of the GK-coaches except for *Maximal arm span* (89%). Among the possible technical errors that a GK can make while performing the *Spread*, all but one item (*Bad timing for starting the gesture,* 7%) were selected as *not an error* or *not important* by more than 10% of the coaches, with two items above the 20% value (*To focus on the striker's support foot & body orientation when shooting*, 21%; and *To first open the legs and then the arms*, 29%).

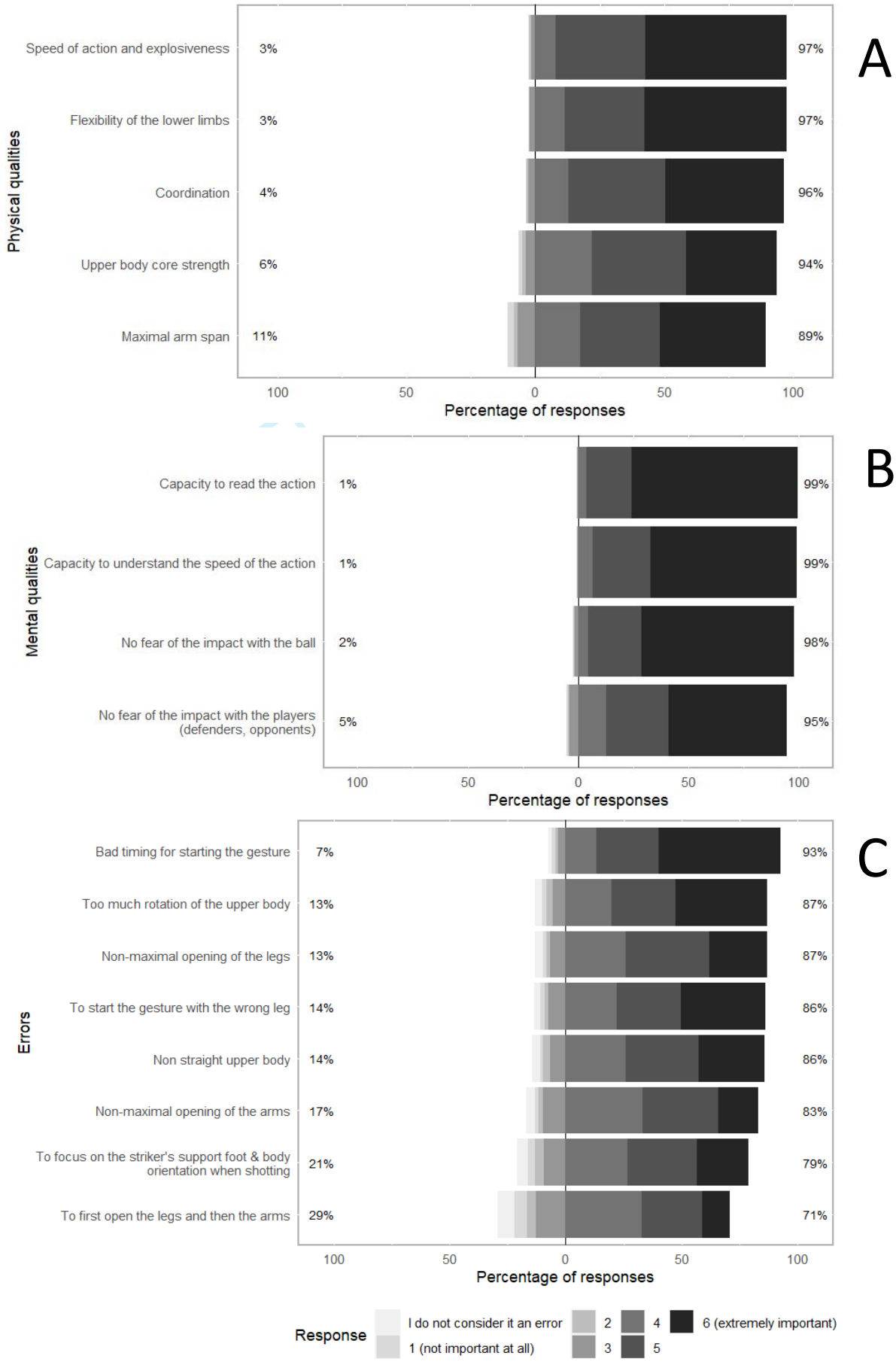

Figure 3. Coaches' responses on the importance of required (A) physical and (B) mental qualities to perform the Croix; and (C) the possible technical errors that players might make when performing it.

Perceptions and experiences on Risk of injury & the Spread

A total of 372 (90.5%) coaches perceived that performing the *Spread* was associated with different types of injury risk (see Figure 4A), with no significant differences ($p > .05$) for coached competition level nor level of GK-courses previously attended. A total of 120 (37.5%) coaches reported having at least one player injured while performing the *Spread* (see Figure 4B for the different type of injuries). Coaches from the *Elite* competition level were significantly more likely ($p<.012$) to have had one player injured, and the *Sub-elite* significantly less likely ($p<.044$). Figure 4 shows coaches' answers to the different types of (A) perceived risks associated to performing the *Spread* and (B) injuries sustained by their players performing the *Spread*. *Contact with another player* was the most perceived risk (68.6%), while close to 1 in 10 coaches (9.5%) perceived no risk. *Contusion* (16.3%) and *Muskulo-skeletal* (15.8%) were the most recalled type of injuries.

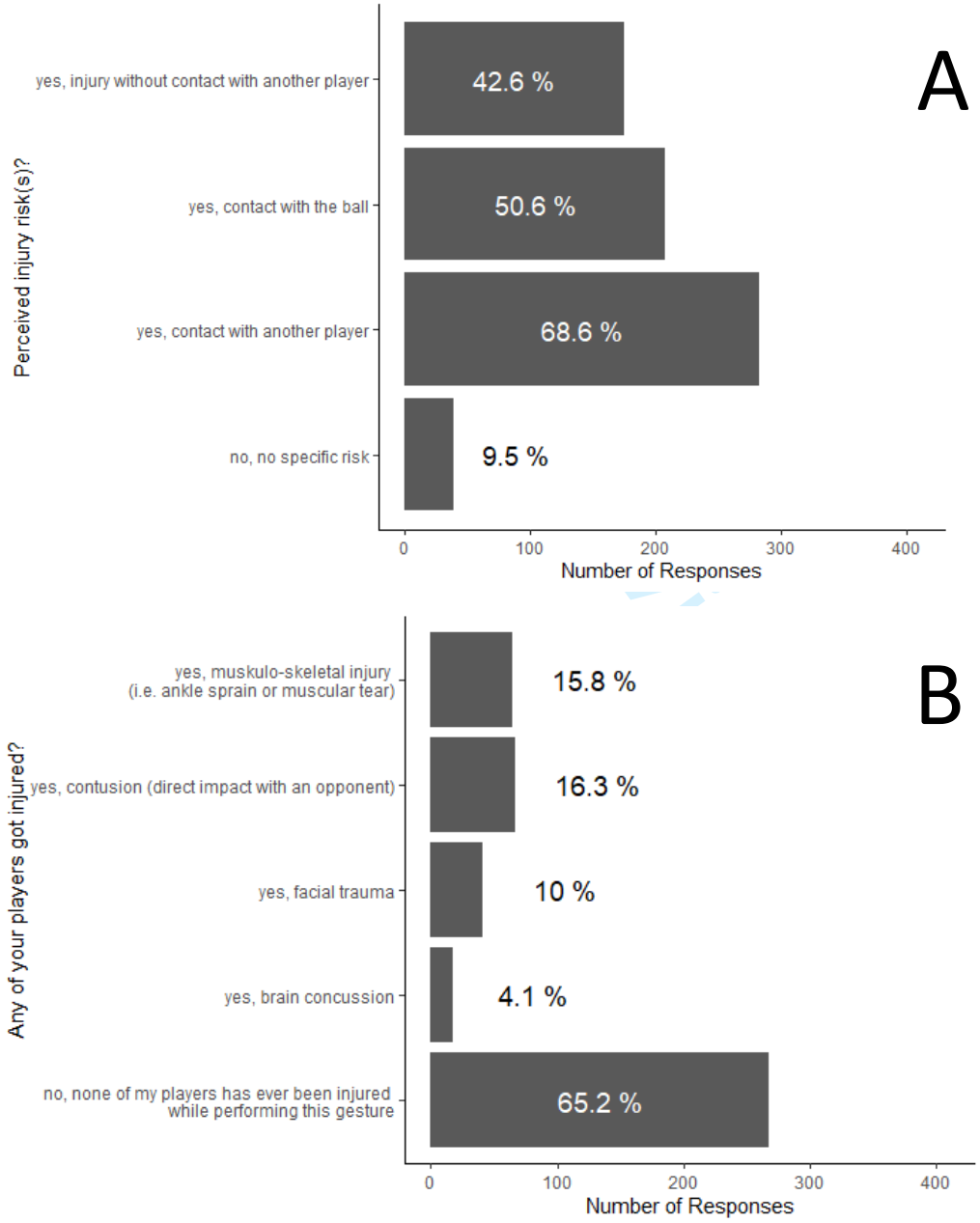

Figure 4. Coaches' answers to: (A) Is performing this gesture related to specific risks for the health of the goalkeeper? If so, which specific risks? (B) Has one (or several) of your players ever been injured while performing this specific gesture? If so, what was the nature of the injury/injuries? Multiple answers were allowed.

The perceived injury risk differences between men's or women's teams, as well as young and adult GKs, can be found in Table 2. No significant differences were found for coached competition level nor level of GK-courses previously attended in any of the questions. Also, no significant differences were found when comparing the coached player's age against the adult/young injury risk; nor for the coached team (*men*, *women,* or *both*) against the men/women's team injury risk.

Table 2. Coaches' perceived difference on injury risk for the Spread based on GK's sex or age.

		GK-Coach Age (yrs.)				GK-Coach Experience (yrs.)			
Higher injury risk for...	***n* (% of total)**	***M* ± SD**	***F***	***p***	***Tukey's***	***M* ± SD**	***F***	***p***	***Tukey's***
Adult GK	106 (25.8%)	39.2±10.6	2.79	*.06*	-	9.2±6.3	7.25	***	*** *vs Young*
Young GK	136 (33.1%)	42.4±10.9			-	13.2±9.2			*** *vs Adult*
No adult/young GK difference	169 (41.1%)	40.5±10.6			-	11.5±7.9			*ns*
Men GK	66 (16.1%)	36.9±11.8	5.85	*	* *vs No*	10.4±8.2	0.70	*.50*	-
Women GK	65 (15.8%)	40.3±11.0			*ns*	11.8±8.7			-
No men/women difference	280 (68.1%)	41.8±10.3			* *vs Men*	11.7±7.9			-

* p<.05 *** p<.001

4. Discussion

To the best of our knowledge, this is the first time GK-coaches have been asked about 1v1 goalkeeping techniques as the main topic of concern. Likewise, in terms of the sample size of responses gathered from GK coaches, this study is the first of its kind. The large number of responses included in this study allows us to get a representative view of the valuable and necessary perspective of the field practitioners.

Knowledge and use of the *Spread*

Based on the responses, the *Spread* is a widely known technique that most GK coaches teach to their GK players. These findings indicate that, although 1v1 events account for few of GK's actions during the game [24], they are relevant enough for GK coaches to pay attention to them. Therefore, further research and stakeholder interventions addressing the GK position should take these situations into account.

When looking into how GK coaches learn this technique, informal sources of knowledge showed to be more popular, with *self-taught (via videos, etc.)* and *discussing with other GK coaches* being 3- and 2-times more frequent, respectively, than learning it from the *literature* or at *GK-specific courses.* These results are in line with prior investigations on sport coaching, which found that non-formal learning is typically preferred as a source of knowledge.[49,50] Yet, on the matter of how this translates to practice, some authors have shown that "[after formal learning] more change was evident in coaching knowledge than in practice behaviors".[51] Contrary to this, the coaches in our study who had learnt

about the *Spread* in GK-specific courses (22.9%), were significantly more likely to teach it than those who did not (i.e., their "coaching behavior"). This interaction suggests that, at least for the case of the *Spread*, a formal way of education might be related to the practical use of the technique by coaches. It seems, however, that the inclusion of the *Spread* in GK courses is limited: despite more than 8 in 10 coaches (81.5%) having previously attended some level of GK coaching courses, less than half (44.8%) reported knowing if the *Spread* was taught in GK courses. These results, coupled with the lack of reference to the *Spread* in recently published GK coaching manuals [40–43], might suggest that the offer of formal knowledge on the *Spread* is limited.

This lack of "formal content" could be influencing coaches' perception on how this technique should be executed (i.e., "coaching knowledge"). When asked if there is a single way to properly execute different GK techniques (e.g. "Catching a volley", "Scoop technique"), Otte, Millar, et al.[28] showed agreement responses ranging from 63.5 (±26.8) to 82.9 (±15.4). The results from our study were considerably lower (37.9 ± 29.0), which could suggest that the *Spread* has not been defined clearly for most GK coaches. In contrast with this, a widespread consensus was reached on the importance of several physical and mental requirements with just two items being selected as *not important* by more than 5% of the coaches (*Upper body core strength*, 6%; and *Maximal arm span*, 11%). While this could be interpreted as a general consensus, it might as well be a reproduction of others beliefs, particularly with the impact that internet and social media play have in informal learning methods.[50] The higher variability among ratings of importance for the potential errors, though, suggests that some misunderstanding is present concerning the technical execution of the *Spread*.

Moving into the practical use of the technique, a majority of the GK-coaches reported using the *Spread* in their trainings, and most of them consider it important for their coached players to master the technique. These results support the idea that the *Spread* is a relevant technique for GK coaches. As to their usage patterns, it seems that most coaches recommend introducing the *Spread* at the U11-U13 level, discarding the hypothesis that this is a technique solely used by adult GKs. The lack of significant differences found between coaches who train/do not train the *Spread* depending on the coached competition level, suggests that the technique is currently being used at all competition levels. This is further supported by most coaches recommending the *Recreational* competition level to teach the *Spread*, discarding the possibility that only GKs at the *Elite* level learn the technique. Although around half of the coaches answered differently (i.e., *Sub-Elite*, *Elite*, or no level recommendation), the significant differences between *Elite* and *Recreational* level coaches, more likely to recommend their own competition level, suggest that this disagreement might be influenced by the individual will of each coach to train the technique at their own competition level. A lack of consensus appears to be present on this subject, which could be due to the previously mentioned lack of knowledge (formal or informal), or the individual GK coaches' preference for the different types of 1v1 techniques.[27,28]

Perceptions and experiences on *Risk of injury* & the *Spread*

The second aim of the study was assessing GK coaches' experiences and perceptions on injury risks related to the *Spread*. Although most coaches recognized some type of injury risk when performing the *Spread*, almost 1 in 10 coaches (9.5%) considered that no risk existed. While it could be obvious that performing this kind of movement entails a certain risk of injury, it is further demonstrated by the fact that 37.5% of the coaches who train the *Spread* reported at least one of their players getting injured performing it. This indicates that there is still space for improvement in raising awareness of the risk of injury associated with these kinds of techniques.

Further into the coaches' perceptions, the most common type of risk of injury was a collision with another player (68.7%) and the two most common types of injuries recalled were *contusion* and *musculoskeletal* (16.3% and 15.8%, respectively). Despite this being the first study investigating GK injuries in 1v1 events, these type of risks and injuries concur with published research on GK injuries.[34] While the risk of collision with another player might be difficult to overcome, protective equipment could help mitigate the consequences. Some authors have already raised the case for the use of helmets by GKs [52], while others have tried to improve other types of padded equipment.[53] Further research in this field should also take 1v1 events into account.

Although no significant difference was observed for coaches' injury risk perceptions; coaches at the *Elite* competition level were significantly more likely to have had an injured player performing the *Spread*. Apart from differences in the way that the movement is performed (e.g., speed or range of motion), this could be related to the higher training hours that players are typically exposed to at this competition level.[13,28] Similarly, some studies have shown a higher risk of injury during training for GK, compared to field players.[54] According to these results, further works investigating the epidemiology or mechanisms of GK injuries, might want to aim at the Elite competition level, in order to obtain a larger data sample.

When asked about perceived injury risk differences between adult/young & men/women GKs, coaches mostly reported "no difference" for both categories, independently of their level of competition and the GK courses previously attended. This remained true when controlling the age or sex of the coached GKs. The coaches' age and coaching experience, however, showed significant interactions: coaches perceiving a higher risk for men were significantly younger than those selecting no men/women difference; and those perceiving a higher risk for adult GKs had significantly less coaching experience than those who considered a higher risk for young GKs. On the one side, these results suggest that, for a majority of GK coaches, the risk of injury related to the *Spread* applies equally to all players. As other researchers have pointed out, different injury risks for young [55] and female players [54,56] exist. On the other side, 31.9% of the coaches perceived a higher risk of injury for either men or women GKs, and more than half (58.9%) did so for either adult or young GKs. The latter shows that a lack of consensus is also present on this matter, and more work would be required in this area. Considering the significant differences found for coaches' age and experience, this work should pay attention on the targeted audiences to make sure it reaches all kinds of populations. This could be done, for example, by adapting the communication channels where content is made available (e.g., traditional media vs new social platforms) or including some awareness content in courses aimed at new unexperienced coaches.

Limitations of study

Even though the sample included in this study is the largest one published to date for a survey focused on GK coaches, conclusions drawn from its results should be taken cautiously. Still, the role qualitative research plays in sport science is increasing in recent years, especially when it comes to injury prevention and the transfer of evidence-based knowledge to coaches and players.[57–59] Coaches have been a valuable source of information in this field [60–62], and they become even more important in the case of the "specialist role" coaches [5], such as GK-coaches, due to the proximity to the players. Moreover, while injury incidence might be lower for GKs than for field players [63–68], studies covering pain [34,69] and overuse injuries [62] reveal that some of the health problems affecting the players can be overlooked, underreported or simply not included in some epidemiological studies.[70]

Another limitation of this study is the low number of women coaches included in the sample (n= 7). Although women's participation in football has been increasing recently, the current proportion of

women coaches only represents 5% of the total.[71] Therefore, a much higher proportion than the one in our study sample seems unlikely. The overall result, however, are inline with the presented results: only two women coaches did not teach the technique (one did not know it); only two learnt about it in GK coaching courses; and three of them recalled having at least one of their players being injured performing the *Spread* technique.

Conclusion & Implications

This is the first time that such a large sample of GK-coaches has been consulted. Our results provide support that the *Spread* is a popular 1v1 technique both known and used by GK-coaches indistinctively of their profiles. Their perceptions and experiences point towards a potential risk of injury related to the execution of the *Spread*; but an apparent lack of agreement seems to be present for the technical execution and the factors associated with a risk of injury. Because of this, further research should pay attention to this technique and build upon our results to properly fill the gap of formal knowledge currently available. Parallel to this, to achieve the knowledge transfer to field practitioners, stakeholders are advised to keep GK-coaches at the center of the learning process and use our findings on their pre-conceived ideas and profile differences when developing the content and targeted profiles in future interventions.

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6. Data Availability

The data of the survey can be made available (anonymized) upon reasonable request to the corresponding author, KGM.

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Supplementary Material

1. Questionnaire (Original French Version)

1.1. Profil de l'entraîneur - page 1

Dans le cadre d'une étude conjointe avec l'Université de Liège, FMCE-Liége & Keepexpert nous vous demandons de répondre au questionnaire suivant sur le « Geste spécifique des gardien(ne)s de but ».

Le temps pour le compléter devrait être d'environ 10 min. Vos réponses aux questions doivent représenter votre expérience personnelle et vos points de vue dans le contexte spécifique de l'entraînement des gardien(ne)s de but. Nous vous demandons de répondre de manière individuelle à ce questionnaire et sans consulter aucune source de données (internet, livres, etc.).

Les réponses seront anonymes et confidentielles et aucune information personnelle tels que le nom, la date de naissance, l'adresse ne sera recueillie. Les résultats seront partagés avec vous si vous fournissez une adresse e-mail (dernière question). Ils seront également utilisés pour améliorer et développer la formation des gardiens de but à l'échelle mondiale en les partageant avec différentes méthodes (par exemple, des revues scientifiques et des conférences).

Si vous avez besoin d'informations complémentaires, vous pouvez contacter le coordinateur de recherche Kevin Gramage Medina par email : k.gramage@uliege.be

1. Vous êtes :
   Un homme - une femme – autre – je préfère ne pas le dire

2. Quel âge avez-vous ?
   Liste déroulante année par année entre 18 et 100 ans

3. Entraînez-vous spécifiquement des gardiens de but ?
   Oui – non.
   --- *Si réponse « non », le participant sera redirigé vers la Page 5 « Avez-vous des remarques ou des commentaires sur ce questionnaire ? »* ---

1.2. Profil de l'entraîneur - page 2

4. Depuis combien années entraînez-vous des gardien(ne)s de but ?
   Liste déroulante année par année entre 0 et 60 ans

5. Combien d'heures par semaine (en moyenne) entraînez-vous spécifiquement des gardien(ne)s ?
   Liste déroulante heure par heure entre 0 et >30h
6. Entraînez-vous des gardien(ne)s en équipe masculine et/ou féminine ?

Équipe masculine – équipe féminine - les deux

7. Quel âge moyen ont les gardien(ne)s que vous entraînez ?
   Liste déroulante année par année entre 0 et 60 ans

8. Quel est le niveau de jeu des joueurs que vous entraînez ?
   Élite – sub-élite – loisir (Plusieurs réponses possibles)

9. Avez-vous suivi une ou plusieurs formations spécifiques pour l'entraînement des gardien(ne)s de but ? Si oui, quel niveau de formation ?
   (Plusieurs réponses possibles)
   - Non, je n'ai aucune formation spécifique d'entraîneur de gardien(ne)s de but
   - Oui, j'ai effectué une ou plusieurs formations locales (ex : club, province) spécifiques d'entraîneur de gardien(ne)s de but
   - Oui, j'ai effectué une ou plusieurs formations nationales (ex : fédération nationale) spécifiques d'entraîneur de gardien(ne)s de but
   - Oui, j'ai effectué une ou plusieurs formations internationales (ex : FIFA, UEFA) spécifiques d'entraîneur de gardien(ne)s de but
   - Oui, je possède le plus haut niveau de formation internationale spécifique d'entraîneur de gardien(ne)s de but
   - Remarques

10. Quels outils utilisez-vous pour votre entraînement spécifique avec des gardien(ne)s ?
    (Plusieurs réponses possibles)
    - Analyse vidéo
    - Dispositifs GPS/accéléromètres
    - Moniteur de fréquence cardiaque
    - Données statistiques des entraînements
    - Évaluation de la vision
    - Évaluation psychologique
    - Je n'utilise pas d'outil
    - Autre:

11. Quels sont les professionnels suivants avec lesquels vous travaillez pour les entraînements avec les gardien(ne)s ?
    (Plusieurs réponses possibles)
    - Médecin
    - Kinésithérapeute
    - Préparateur physique
    - Analyste de données
    - Analyste vidéo
    - Je ne travaille pas avec d'autres professionnels
    - Autre:

12. Considérez-vous qu'il existe une taille minimale pour jouer au poste de gardien(ne)s de but à l'âge adulte ? Si oui, quelle taille ?
    - Je ne sais pas
    - Non
    - Oui (taille minimale en cm)

1.3. Gestuelle spécifique du gardien de but

13. Sur base des images précédentes, connaissez-vous ce geste spécifique ?
    oui – non.
    Si oui, quel nom lui donnez-vous ? (Réponse ouverte)

14. Enseignez-vous ce geste aux gardien(ne)s de but que vous entraînez ?
    oui – non

15. A votre connaissance, ce geste est-il enseigné dans des formations spécifiques destinées aux entraîneurs de gardien(ne)s ?
    oui – non – je ne sais pas

16. Où avez-vous appris ce geste ? (Plusieurs réponses possibles)
    - je l'ai appris seul après avoir vu ce geste chez d'autres gardien(ne)s (en live ou en vidéo)
    - via une formation d'entraîneur de gardien(ne)s de but
    - via des lectures d'articles
    - via des échanges avec des collègues entraîneurs de gardien(ne)s de but
    - Autre:

17. À partir de quel âge pensez-vous que ce geste devrait être enseigné ?
    Liste déroulante âge par âge de 5 à 25 ans ; 1er item dans la liste : je ne pense pas que ce geste doit être enseigné

18. Pensez-vous que l'apprentissage de ce geste doit être enseigné à partir d'un certain niveau de jeu ?
    - non, je ne pense pas que ce geste doit être enseigné
    - oui, à partir de niveau de jeu ÉLITE
    - oui, à partir de niveau de jeu SUB-ÉLITE
    - oui, à partir de niveau de jeu LOISIR

19. Quelles sont selon vous les qualités physiques essentielles pour une réalisation optimale de ce geste ? 0 (pas du tout important) à 5 (extrêmement important) :
    - Envergure maximale
    - Souplesse des membres inférieurs

- Coordination
- Vitesse d'action et explosivité
- Gainage du haut du corps
- Autre:
-

20. Quelles sont selon vous les qualités mentales essentielles pour une réalisation optimale de ce geste ? 0 (pas du tout important) à 5 (extrêmement important) :
    - Ne pas avoir peur de l'impact du ballon
    - Ne pas avoir peur de l'impact du joueur / des joueurs (défenseur / attaquant)
    - Capacité de lecture de l'action
    - Capacité de compréhension de la vitesse de l'action
    - Autre:

21. Il n'existe qu'une seule technique pour réaliser ce geste
    Échelle 0 (pas du tout d'accord) - 100 (tout à fait d'accord)

22. La maîtrise de ce geste (par un gardien que vous entraînez) est indispensable
    Échelle 0 (pas du tout d'accord) - 100 (tout à fait d'accord)

23. Il peut exister un certain nombre d'erreurs dans la réalisation technique de ce geste par les gardien(ne)s de but.
    Pour chaque item, classez l'erreur possible de 0 (erreur pas du tout importante) à 5 (erreur extrêmement importante)
    - Mauvais timing de déclenchement du geste
    - Ouverture non maximale des bras
    - *De prendre les informations sur les pieds d'appui et l'orientation du corps de l'attaquant au moment de la frappe*
    - Ouverture non maximale des jambes
    - Déclenchement du geste avec la mauvaise jambe
    - *D'ouvrir d'abord le bas du corps (les jambes) et après le haut du corps (bras)*
    - Rotation trop importante du corps
    - Haut du corps non droit
    - Autre :

1.4. Risques liés au geste

24. La réalisation de ce geste s'accompagne-t-elle de risques particuliers pour la santé du gardien(ne)s de but ? Si oui, quel(s) risque(s) particulier(s) ?
    (Plusieurs réponses possibles)
    - non, aucun risque particulier
    - oui, contact avec un adversaire
    - oui, contact avec un ballon
    - oui, blessure sans contact avec un autre joueur
    - oui, autre:

25. Un(e) de vos joueuses/joueurs s'est-il/elle déjà blessé(e) en réalisant ce geste spécifique ? Si oui, quel(s) type(s) de blessure(s) s'est-il/elle occasionné(e)?
    oui – non ; Si oui, quel(s) type(s) de blessure(s) s'est-il/elle occasionné(e)? (choisissez une ou plusieurs options) commotion cérébrale - traumatisme facial – contusion (coup

direct de l'adversaire) – blessure musculosquelettique (ex : entorse de genou ou lésion musculaire) – autre

26. Pensez-vous qu'il existe une différence de risque entre les gardien(ne)s d'équipes féminines et masculines lors de la réalisation de ce geste ? Si oui, le risque vous semble-t-il accru pour une équipe féminine ou une équipe masculine ?
    - non
    - oui, risque accru pour une équipe masculine
    - oui, risque accru pour une équipe féminine

27. Pensez-vous qu'il existe une différence de risque entre les gardien(ne)s de but jeunes et adultes lors de la réalisation de ce geste ? Si oui, le risque vous semble-t-il accru pour un(e) gardien(ne) jeune ou un(e) adulte ?
    - non
    - oui, risque accru pour un(e) gardien(ne) jeune
    - oui, risque accru pour un(e) gardien(ne) adulte

1.5. Avez-vous des remarques ou des commentaires sur ce questionnaire ?

28. Écrivez vos commentaires ci-dessous :

1.6. Contact dans le cas où des développements relatifs à cette thématique

29. Souhaitez-vous être recontactés dans le cas où des développements relatifs à cette thématique seraient mis en place ?
    - Non
    - Oui, adresse e-mail :

2. Questionnaire (Translated English Version)

2.1. Coach profile (page 1/2)

As part of a joint study of the University of Liége, FMCE-Liége & Keepexpert, we ask you to answer the following questionnaire on the "Specific gesture of the goalkeeper".

The time to complete it should be around 10 min. Your answers must represent your personal experience and views in the specific context of goalkeeper training. We ask you to answer it individually and without consulting any external data source (internet, books, etc.).

The answers will be anonymous and confidential, and no personal information such as name, date of birth, address will be collected. The results will be shared with you if you provide an email address (last question). They will also be used to improve and develop the training of goalkeepers globally by sharing them with different methods (e.g., scientific journals and conferences).

If you need further information, you can contact the research coordinator Kevin Gramage Medina via email: k.gramage@uliege.be

1. You are:
    - a man
    - a woman
    - other
    - I'd rather not say

2. How old are you?
   18 - 100 years old

3. Do you specifically train football goalkeepers?
   Yes – no (*if "no", jump to "Contact in case of further developments related to this field"*)

2.2. Coach profile (page 2/2)

4. How many years have you been training goalkeepers?
   0 – 60 years

5. How many hours per week (in average) do you specifically train goalkeepers?
   0 – >30h

6. Do you train goalkeepers playing for a men's or women's football team?
    - men's team
    - women's team
    - both

7. How old are (in average) the goalkeepers you are training?
   0 – 60 years old

8. What is the level of the goalkeepers you train? (Several answers are possible)
    - Elite
    - Sub-elite
    - Recreational

9. Did you follow one or several goalkeeper specific courses? If so, what was the level of the course(s)? (Several answers are possible)
    - No, I did not follow goalkeeper courses
    - Yes, I have followed one or several local (i.e., club, provincial) goalkeeper courses
    - Yes, I have followed one or several national (i.e., federation, national) goalkeeper courses
    - Yes, I have followed one or several international (i.e., FIFA, UEFA) goalkeeper courses
    - Yes, I have followed the highest international goalkeeper courses
    - Remarks

10. Which of the following tool(s) do you use for your goalkeeper specific training? (Several answers are possible)
    - Video analysis
    - GPS/Accelerometers sensors
    - Heart rate monitoring
    - Statistical data of the trainings
    - Evaluation of the vision
    - Psychological evaluation
    - I do not use any of these tools
    - Other:

11. Which of the following professionals do you work with for your goalkeeper trainings? (Several answers are possible)
    - Medical doctor
    - Physiotherapist
    - Physical trainer
    - Data analyst
    - Video analyst
    - I do not work with other professionals
    - Other:

12. Do you consider that a minimal height is required to play as an adult goalkeeper? If so, which height?
    - I don't know
    - no
    - yes (minimal height in cm)

2.3. Specific gesture of the goalkeeper

13. Based on the previous images, do you know this specific gesture?
    - No
    - Yes. Which name do you give to this gesture?

14. Do you teach this gesture to the goalkeepers you train?
    Yes – No

15. To your knowledge, is that gesture taught during courses dedicated to goalkeeper coaches?
    - Yes
    - No
    - I don't know

16. Where did you learn this gesture? (Several answers are possible)
    - I learned it on my own after seeing this gesture performed by other goalkeepers (live or on videos)
    - via a training dedicated to goalkeeper coaches
    - via the reading of articles
    - via discussions with other goalkeeper coaches
    - Other:

17. From which age do you think this gesture should be taught?
    5 – 25 years old; First item on the list: *I don't think this gesture should be taught*

18. Do you think that this gesture should be taught from a specific playing level?
    - I don't think this gesture should be taught
    - yes, from a ELITE playing level
    - yes, from a SUB-ELITE playing level
    - yes, from a RECREATIONAL playing level

19. In your opinion, which physical qualities are required to optimally perform this gesture? 0 (not at all important) to 5 (extremely important):
    - Maximal arm span
    - Flexibility of the lower limbs

- Coordination
- Speed of action and explosiveness
- Upper body core strength
- Other:

20. In your opinion, which mental qualities are required to optimally perform this gesture? 0 (not at all important) to 5 (extremely important):
    - No fear of the impact with the ball
    - No fear of the impact with the players (defenders, opponents)
    - Capacity to read the action
    - Capacity to understand the speed of the action
    - Other:

21. There is only one technique to perform this gesture
    Scale 0 (Do not agree at all) - 100 (Fully agree)

22. Mastering this gesture (for a goalkeeper you train) is essential
    Scale 0 (Do not agree at all) - 100 (Fully agree)

23. Some technical errors may be made when a goalkeeper is performing this gesture For each item, indicate the importance of the error from 0 (not important at all) to 5 (extremely important):
    - Bad timing for starting the gesture
    - Non-maximal opening of the arms
    - To take information on the support foot and the orientation of the body of the striker at the moment of the shot
    - Non-maximal opening of the legs
    - To start the gesture with the wrong leg
    - To open first the lower body (the legs) and then the upper body (the arms)
    - Too much rotation of the upper body
    - Non straight upper body
    - Other:

2.4. Risks related to the gesture

24. Is performing this gesture related to specific risks for the health of the goalkeeper? If so, which specific risks? (Several answers are possible)
    - no, no specific risk
    - yes, contact with another player
    - yes, contact with the ball
    - yes, injury without contact with another player
    - yes, other:

25. Has one (or several) of your players ever been injured while performing this specific gesture? If so, what was the nature of the injury/injuries? (Several answers are possible)
    - no, none of my players has ever been injured while performing this gesture
    - yes, brain concussion
    - yes, facial trauma
    - yes, contusion (direct impact with an opponent)

- yes, muskulo-skeletal injury (i.e., ankle sprain or muscular tear)
- yes, other:

26. Do you think there is a difference in injury risk between goalkeepers playing for a men's or women's football team when performing this gesture? If so, do you think the risk is greater for males or females?
    - no
    - higher risk for goalkeepers in a men's team
    - higher risk for goalkeepers in a women's team

27. Do you think that the injury risk, while performing this gesture, differs between young and adult goalkeepers? If so, do you think that the injury risk is increased for young or adult goalkeepers?
    - no
    - yes, injury risk increased for young goalkeepers
    - yes, injury risk increased for adult goalkeepers

2.5. Do you have any additional remarks or comments concerning this survey?

28. Write your comments below:

2.6. Contact in case of further developments related to this field

29. Would you like to be contacted in case further developments related to this topic were to be put in place?
    - no
    - yes, e-mail address:

3. Supplementary Tables

Table 1. At which competition level (CL) should the cross technique start to be trained?

Coaches' Competition Level		Recommended Competition Level: No	Elite	Sub-elite	Recreational	TOTAL
Elite	Count	36	45	84	84	249
	% of total	8.76%	10.95%	20.44%	20.44%	60.58%
	Std. residuals	2.603	4.098*	2.368	-6.539*	
Sub-Elite	Count	6	4	33	46	89
	% of total	1.46%	0.97%	8.03%	11.19%	21.66%
	Std. residuals	-1.505	-2.615	1.786	1.062	
Recreational	Count	4	3	4	62	73
	% of total	0.97%	0.73%	0.97%	15.09%	17.76%
	Std. residuals	-1.707	-2.421	-4.953*	7.217*	
TOTAL	Count	46	52	121	192	411
	% of total	11.19%	12.65%	29.44%	46.72%	100%

CL: Competition Level. *Significantly ($p < .05$) different from the rest.

4. Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Item category	Checklist Item	Explanation	Page & Line #
Design	Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	Yes. See Methods (p.3 #101-110)
IRB (Institutional Review Board) approval and informed consent process	IRB approval	Mention whether the study has been approved by an IRB	Not required
	Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	See Methods (p.2 #73-77)
	Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	Only email, pass-protected in *sondageonline.com*

Development and pre-testing	Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	See Methods (p.2 #68-77)
Recruitment process and description of the sample having access to the questionnaire	Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample, which the investigator knows (passwordprotected survey).	Open. See Methods (p.3 #101-110)
	Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	Yes. See Methods (p.3 #101-110)
	Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement, as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	See Methods (p.3 #101-110)
Survey administration	Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	Web (sondageonline.com). Manual.
	Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	See Methods (p.3 #101-110)
	Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	Voluntary
	Incentives	Were any incentives offered (e.g., monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	No

	Time/Date	In what timeframe were the data collected?	January to March 2023.
	Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	No.
	Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	See Methods (p.3 #84-85)
	Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	27 (3, 9, 11, 4) + 2 (remarks & mail)
	Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	4 + remarks & mails
	Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if "yes", how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a nonresponse option such as "not applicable" or "rather not say", and selection of one response option should be enforced.	Yes, all mandatory (JAVAScript). Offered "Idk" (12, 15, 18) & "rather not say" (gender).
	Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	Yes, back button available.
Response rates	Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	Cookies-based
	View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	Not applicable
	Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called "recruitment" rate.	Not applicable

	Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate "informed consent" page or if the survey goes over several pages. This is a measure for attrition. Note that "com-pletion" can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word "completeness rate".)	TOTAL: 460/801 FR: 368 / 649 EN: 62 / 117 ES: 30 / 41
Preventing multiple entries from the same individual	**Cookies used**	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	Yes, cookies prevented duplicate entry
	IP Check	Indicate whether the IP address of the client computer was used to identify po- tential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	No IP used
	Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	Verify contact details (email)
	Registration	In "closed" (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	Open survey

Analysis	Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	Only completed answers.
	Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	Manual check of mean & median. No unrealistic values found.
	Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	No