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Upskilling coaches and physical education teachers to deliver injury prevention in children: exploring knowledge, confidence and attitude using a novel Bayesian approach

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ABSTRACT

Knowledge, attitude and confidence around injury prevention for children is important if grass-root sport coaches and physical education teachers want to deliver such programmes, but it is unclear if they have such skills. 95 grass-root coaches and PE teachers (25 females, 70 males) completed a validated questionnaire exploring use, knowledge, attitude towards, and confidence to deliver youth movement competency training. A Bayesian factor was used to quantify for and against the hypothesis of independence (H_0) in each of the survey questions with regards to sex differences. Only 35% of participants had heard of injury prevention programmes and 47% included movement competency training in their practice. Significantly more males had knowledge of and were using injury prevention in their coaching than females (BF_{10} Poisson = 2.67 and 1.4). Most participants (93%) felt that incorporating an injury prevention programme is important but recognise they need more knowledge around injury prevention programmes (90%). 68% had a positive attitude towards, and 67% were confident to deliver movement competency training. Less than half of participants were employing movement competency into their daily practice, and most suggested they would benefit from

new knowledge. Training and upskilling using culturally suitable methods are required especially for females who reported less knowledge and confidence.

Keywords: Coach education, Youth, Injury prevention

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1. 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 & Cronin, 2012)

And that injury constitutes a significant public health burden. Coaches and Physical Education (PE) teachers play a major role in encouraging and ensuring that children in PE classes and sport settings adopt appropriate safe practices (White et al., 2021).

However, the extent to which coaches and PE teachers undertake this role is influenced by their knowledge, beliefs, and attitude towards movement competency and injury prevention programmes (IPPs). IPPs need to be age, sex, and maturation specific with clear progressions as a child grows and matures. There is currently a need to develop materials that are suitable for grass-root coaches and PE teachers, founded on principles of fun and high levels of engagement in these settings (White et al., 2021).

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 an 89% reduction in injury rates during just one season of the adoption of an injury prevention programme (Gilchrist et al., 2008). There is also good evidence to show that children who move well in sport and PE generally have more fun, greater self-esteem and stay engaged in

physical activity, leading to an important part of overall childhood physical, emotional, social and psychological health (Logan et al., 2019).

Alongside growing support for the efficacy of injury prevention programmes, evidence of significant challenges to implementing these programmes has emerged. Previous studies have indicated significant knowledge gaps amongst community level coaches regarding injury prevention programmes (McKay et al., 2014) (Orr et al., 2013)

Currently there are very little data focusing on Physical Education teachers, which is surprising given the daily teaching of children in a sport and physical activity context.

A good range of children regularly participate in sport across the Kingdom of Saudi Arabia and the recent development of the Vision2030 strategy (Alhazmi & Kamarudin, 2020)

Highlights the Kingdom's commitment to developing sporting excellence, as well as promoting sport activities in the community. The Saudi government's strong support for women's sports, can be seen in the decisions made by the government in the last few years, for example, supporting sports in girls' schools (Paul, 2017)

Licensing women's gyms and establishing women's sports competitions (Lysa, 2020).

A recent survey suggests that there is a growing trend in the uptake of sporting activities (23% increase since 2015 and a 150% increase in women's participation in sport) (Alqahtani et al., 2021)

Although the overall levels of those participating in sport and physical activity is low (Al-Zalabani et al., 2015)

And fewer females participate than men (Albujulaya et al., 2023).

Many children participating in sport do so at school and grassroot level and as such the local grassroots coach and PE teacher hold the responsibility for the

welfare of the children they coach and teach. Richmond et al. (Richmond et al., 2020)

Noted that key barriers to successful implementation of IPPs were the complexity of the program (with the need to limit the number of components and equipment required), and lack of readiness for implementation. Key facilitators included adaptability of the school but most importantly a positive implementation climate and culture. Data from Barden et al. (Barden et al., 2022a) (Barden et al., 2022b)

Also in school settings, illustrates the importance of adapting programs to meet the needs of PE teachers based on their setting and context. The ability to adapt materials and new knowledge appears to be important in the success of implementing the program. Given that access to physical education for females in Saudi Arabia is relatively new (Paul, 2017)

It is likely that knowledge gaps exist for female PE teachers. To date no studies have investigated sex differences in knowledge, attitude and confidence to deliver movement competency in coaching and school settings in the Kingdom of Saudi Arabia. In this context understanding existing knowledge, attitude and confidence is the first step in developing appropriate programmes that can add value by providing new knowledge and confidence.

Often, coach education and continuing professional development (CPD) for registered coaches are managed and delivered by the National associations/federations and teacher training by universities. Grassroot coaches and PE teachers do not have the support mechanisms that are available to coaches in elite environments (e.g. physical performance coaches) even though player well-being forms a large part of their remit as the coach/teacher. It is important to understand current knowledge and confidence to deliver movement competency training so that appropriate workshops can be developed that meet the needs of the workforce and subsequently translate down to the end user, in

this case children. Therefore, the main objective of this study was to understand the current knowledge, attitude and confidence of grassroot coaches and PE teachers to deliver movement competency and injury prevention training. A secondary objective was to observe if there were any sex differences in these outcomes given the relatively new introduction of female physical education in the Kingdom of Saudi Arabia.

2. Methods

- ***Participants***

Ninety-five participants (70 males and 25 females) who were grassroot coaches and/or PE teachers from all regions in Saudi Arabia were invited to attend an online workshop (Move Well, Be Strong found here www.movewellbestrong.com). Recruitment was supported by the Saudi Ministry for Sport and Saudi Olympic Federation. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of the University of Gloucestershire (DESTECROIX21-22(2)) on 19th May 2022. Written consent was obtained from all participants via the online survey.

- **Questionnaires**

Coaches' and PE teachers' knowledge of, attitude towards, and confidence to deliver youth injury prevention as part of their coaching and PE lessons were explored at the start of the workshop via a validated online questionnaire (using SurveyHero). 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 a local advisor in Saudi Arabia 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 (O'Brien & Finch, 2016) and De Ste Croix et al (De Ste Croix et al., 2020) exploring the perceptions of the deliverers of injury prevention training in grass-root coaches. Following pilot testing, the final set of questions were developed and agreed upon through consultation between the authors, and an external panel of experts. The first part of each questionnaire elicited demographic and background information from coaches and teachers. 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 both English and Arabic.

A number of measures were put into place to try and maximise the response rates to the surveys including: (a) Offering the questionnaires in both English and Arabic (b) Time given to complete questionnaire before the start of the online workshop; (c) direct emailing of the web link (URL) to the Questionnaire prior to the online workshop for completion; (d) following up with numerous reminders to non-respondents. Inclusion criteria were; i) the participant was willing and able to give informed consent for participation in the project; ii) they were aged 18 years or above; iii) they coach or teach children

- ***Questionnaire analysis***

Descriptive data are presented as percentage values (%) and exclude incomplete answers to questions. Where a five-point Likert scale was used responses 4 and 5 (agree/strongly agree) were used to show agreement to that question. Statistical analyses were performed using JASP (Amsterdam,

Netherland; version 0.10). For all sex difference analyses on the pre-questionnaire data, the null hypothesis assumed no significant differences would be observed between sexes for any survey question. For each of the possible responses of the survey questions, the frequency and proportion of cases coded were calculated (both grouped and separately for sex) through a R (rows = possible responses of the questions) x C (columns = sex [females, males, and NS/NC]) Bayesian contingency table.

The Bayesian factor described by Gunel and Dickey (Gunel & 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 sex of the grass-root coaches and PE teachers 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.

3. *Results*

- ***Descriptive data***

In total 81% of participants held either a coaching or teaching qualification with more males (86%) holding qualifications compared to females (68%) (although this difference did not reach statistical significance: BF_{10} Poisson = 2.01).

- ***Current knowledge, attitude and confidence***

61% of participants considered children to be at high risk of injury with 93% of participants indicating that they thought injury prevention in children was possible. 89% of participants considered getting injured in childhood could impact quality of life in adulthood. 93% of responses indicated that exercise used to prevent injuries in children needed to be fun and progressive. There were no

significant sex differences in responses to these initial questions. However, although 90% of participants felt that getting injured could have a negative effect on performance there was a significant sex difference with more responses in males (97%) compared to females (68%) (BF_{10} Poisson = 41.18).

Participants ranked helping children to develop movement skills as their most important role (47%) with developing technical skills as their least important role (15%). No sex differences were observed in terms of the importance of developing movement skills (BF_{10} Poisson = 0.16).

Only 35% of participants had heard of any injury prevention programmes and 47% included movement competency training in their coaching/PE. In both cases significantly more males reported having knowledge of and were using injury prevention in their coaching and PE lessons than females (BF_{10} Poisson = 2.67 and 1.4 respectively). Males also had significantly greater confidence in delivering injury prevention training compared to females (These data can be seen in figure 1 and 2 below:

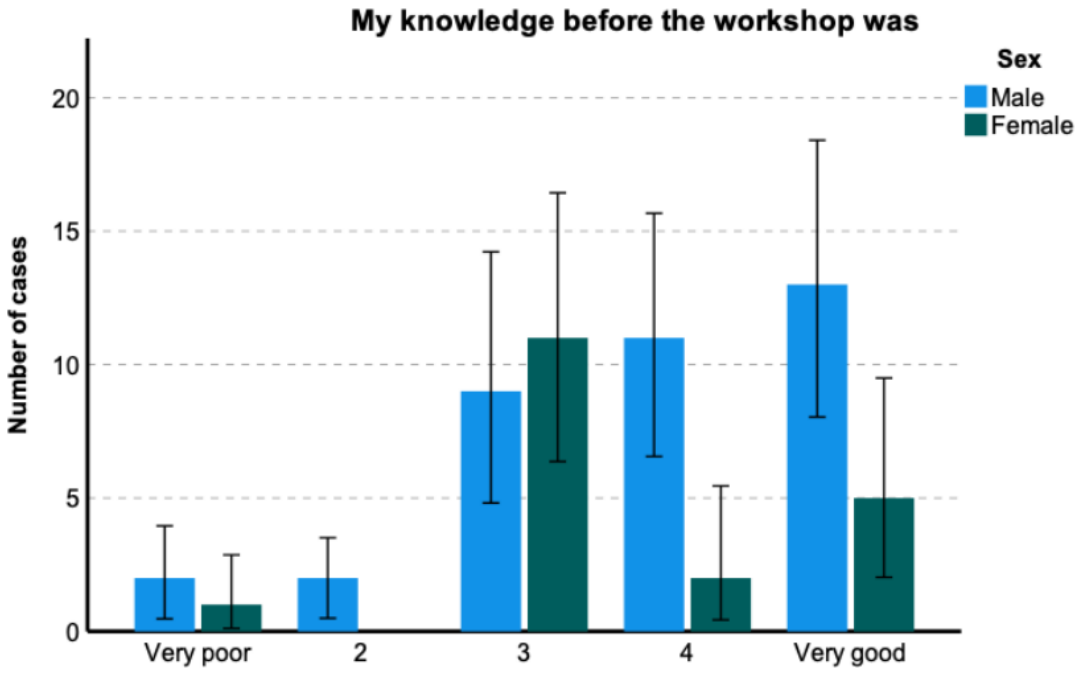

Figure 1: Sex differences in knowledge of injury prevention programmes

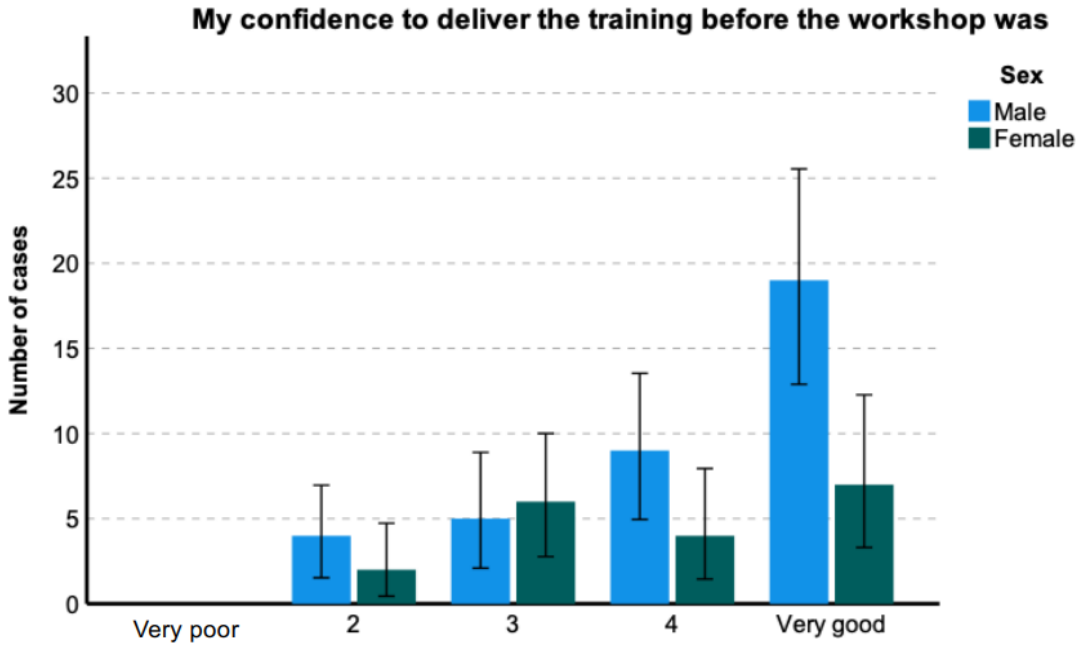

Figure 2: Sex differences in confidence to deliver injury prevention training

Nearly all participants (93%) felt that incorporating an injury prevention programme would be good for children. Most coaches indicated they needed more knowledge around injury prevention programmes (90%), understanding of growth and maturation and injury (87%) and specific exercise to improve movement competency (87%). Two thirds of participants had a positive attitude towards (68%) and were confident to deliver (67%) movement competency training. Tables 1-3 show the Bayesian analysis.

Table 1: Have you heard of any injury prevention programmes?

Possible answers	Sex			Total
	Females	Males	NS / NC	
Yes				
- Nº cases	4	26	3	33
- Proportion column (%)	16	37,1	100	33.7
No				
- Nº cases	21	44	0	64
- Proportion column (%)	84	62.9	0	66.3
Total				
- Nº cases	25	70	3	98
- Proportion column (%)	100	100	100	100

BF_{10} Poisson = 9.1 (moderate evidence for H_1) (grouped data)
BF_{10} Poisson = 2.67 (anecdotal evidence for H_1) (excluding the NS/NC label)

Table 2: Do you use any injury prevention resources currently in your coaching/teaching sessions?

Possible answers	Sex			Total
	Females	Males	NS / NC	
Yes				
- Nº cases	8	35	3	46
- Proportion column (%)	32	50	100	46,9
No				
- Nº cases	17	35	0	52
- Proportion column (%)	68	50	0	53.1
Total				
- Nº cases	25	70	3	98
- Proportion column (%)	100	100	100	100
BF_{10} Poisson = 1.71 (anecdotal evidence for H_1) (grouped data)				
BF_{10} Poisson = 1.4 (anecdotal evidence for H_1) (excluding the NS/NC label)				

Table 3: Do you think an injury prevention programme would be useful for your athletes/children?

Possible answers	Sex			Total
	Females	Males	NS / NC	
Yes				
- Nº cases	23	65	3	91
- Proportion column (%)	92	92.9	100	92.9
No				
- Nº cases	1	0	0	1
- Proportion column (%)	4	0	0	1
Unsure				
- Nº cases	1	4	0	5
- Proportion column (%)	4	5.7	0	5.1
Depends on age group				
- Nº cases	0	1	0	1
- Proportion column (%)	0	1.4	0	1
Total				
- Nº cases	25	70	3	98
- Proportion column (%)	100	100	100	100
BF_{10} Poisson > 100 (extreme evidence for H_1) (grouped data)				
BF_{10} Poisson = 0.02 (very strong evidence for H_0) (excluding the NS/NC label)				

4. Discussion

The findings of the current study indicate that grassroot coaches' and PE teachers' knowledge and confidence to deliver injury prevention training to children is in need of improvement, with greater reported knowledge evident in males compared to females. There is a reasonably positive attitude towards this

type of training with around two thirds of all coaches and teachers 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 and improving movement competency in children. Despite this less than half (47%) were currently including injury prevention/movement competency training into their coaching and teaching practice. This finding is in agreement with the previous work of Frank et al. (Frank et al., 2015) 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 [22-24]. However, as Emery and colleagues (Emery et al., 2020) 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 and PE teachers currently using some form of injury prevention programme in their coaching (47%) is higher than those previously reported on youth football coaches, which range from 22-31% [18, 25-28]. Interestingly more males were using some form of programme than females and this probably relates back to the significantly lower reported knowledge regarding injury prevention in youth for female coaches and PE teachers.

Given that all of the coaches and teachers (100%) felt that injury prevention is important for youth athletes it seems somewhat strange that coach and teacher education in the Kingdom do not appear to provide them 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).

This may be due to the high demands placed on grass root coaches and PE teachers to upskill children in a wide range of areas that includes tactical/technical components as well as issues surrounding safeguarding, physical and psychosocial development. It has also been suggested that low frequency of training sessions/PE lessons (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 and PE courses it may be necessary for Federations and teacher training institutions to include this type of training as a compulsory activity to add to the welfare agenda of children.

Overall knowledge regarding injury prevention training was low (55%) and there were sex differences with males indicating more knowledge than females. This might relate to the previous comment regarding the lack of time to deliver such knowledge to coaches and teachers within the limited timeframe that grass-root coach education awards often contain. In a recent study by Mawson et al. (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 35% 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. (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 maybe unsurprising that females have less knowledge than males given the relatively new introduction of female PE in schools within Saudi Arabia. Previous research has also identified that females tend to have lower coaching confidence than males (Marback et al., 2005) (Villalon & Martin, 2020).

A study in the UK found that female coaches lacked self-belief and confidence in their coaching which may be a consequence of their cultural and historically marginal position (Norman, 2012).

This may explain the lower knowledge levels in females in the current study, however further research is needed specifically around self-belief and cultural dimensions. It is therefore important that coaching and PE training courses introduce injury risk and prevention at the lowest award level to provide coaches and teachers with the knowledge and confidence to deliver such programmes.

Despite a lack of knowledge regarding injury prevention training, 68% of participants had a positive attitude towards including this type of training into their coaching and teaching. Most of the other coaches and teachers 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. It is encouraging to see a generally positive attitude towards this important area of child welfare and reinforces that coaches and teachers would be willing to adopt such programmes if they were given the knowledge and confidence to do so. Interestingly just over two thirds of coaches and teachers (68%) felt confident to deliver injury prevention training but this is despite the fact that only 35% had heard of any injury prevention programmes. This was unexpected and raises the

question regarding the suitability of the programmes currently being delivered, especially as knowledge around injury prevention was lower than confidence to deliver. It is important that programmes are underpinned by a sound research base and that they are implemented correctly under a RE-AIM framework. Our findings, indicating that two thirds of coaches and teachers were confident to deliver such training, is greater than that previously reported in the studies of De Ste Croix (De Ste Croix et al., 2020) and Frank et al (Frank et al., 2015).

Frank et al. (Frank et al., 2015) reported that 41% of female coaches felt comfortable in leading an injury prevention element in their coaching session and De Ste Croix (De Ste Croix et al., 2020) only 25% confident to deliver. 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).

There is a disconnect between confidence to deliver and actual delivery with 68% feeling confident but only 47% actually 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 (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 and PE teachers with the confidence to deliver are not implementing this into their coaching practice. The low levels of coach implementation is of concern but it is equally 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 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 and PE teachers.

5. Conclusion

The findings of the current study reinforce the need that a key focus must be placed upon coach and teacher education to ensure effective adoption and implementation via developing knowledge, changing attitudes and behaviours, especially in those coaches and teachers who are early in their coaching careers. There is clearly a specific need to provide females with the knowledge and confidence that they need so that they can embed movement competency into their coaching and teaching. Appropriate resources are therefore required to support knowledge gain that can be achieved via a dedicated workshop. This will aid grassroot coaches and PE teachers in adopting, implementing and maintaining movement competency training to promote lifelong habits in the children they coach/teach. As Villalon and Martin (Villalon & Martin, 2020)

Conclude, the lower coaching efficacy in females needs to be considered when developing educational materials and workshops. 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 organisations. 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.

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