

The use and modification of injury prevention exercises by professional youth soccer teams

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The efficacy of injury prevention exercise programs (IPEPs) for amateur youth soccer has been established, but little is known about their adaptability to other soccer populations. This study aimed to assess the use of individual injury prevention exercises by professional youth soccer teams, against the industry-standard, FIFA 11+ program. Four teams' chosen IPEPs were observed across one season and documented on a standardized form. The use of each FIFA 11+ exercise was coded as "performed", "performed modified" or "not performed". The proportion of the 160 observed sessions containing each individual exercise was calculated. Staff provided reasons for their use and modification of FIFA 11+ exercises. On average,

individual FIFA 11+ exercises were conducted in original form in 12% of the sessions (range 0–33%), and in modified form in 28% of sessions (range 2–62%). The five most frequently observed exercises, in either original or modified form, were "bench" (72%), "squats" (69%), "running straight" (68%), "single-leg stance" (66%), and "sideways bench" (64%). Staff modified exercises to add variation, progression, and individualization, and to align with specific training formats and goals. Professional youth soccer teams often use injury prevention exercises similar to those in the FIFA 11+, but tailor them considerably to fit their implementation context.

In view of soccer's world-wide popularity and high injury rates, the development of evidence-based strategies to prevent soccer injuries is of paramount importance (Bizzini et al., 2013). In 2006, the Fédération Internationale de Football Association (FIFA) teamed with two sports injury prevention research centres to develop the FIFA 11+, a basic injury prevention exercise program aimed at amateur soccer players (Bizzini & Dvorak, 2015). The results of large-scale randomized controlled trials (RCTs) have since supported the efficacy of the FIFA 11+ in teams of amateur female (Soligard et al., 2008), amateur male (Owoeye et al., 2014), and collegiate male soccer players (Silvers-Graneli et al., 2015). Other injury prevention exercise programs (IPEPs) for amateur soccer, including the Knäkontroll (Waldén et al., 2012) and Prevent Injury Enhance Performance (Mandelbaum et al., 2005), also have demonstrated efficacy. However, recent research highlights

that, in addition to establishing efficacy, achieving adequate compliance to IPEPs plays a key role in their ultimate success (Soligard et al., 2010; Hägglund et al., 2013; Steffen et al., 2013).

As support for the FIFA 11+'s efficacy grows (Al Attar et al., 2016), researchers have also explored the program's adaptability to other soccer populations, including veteran (Hammes et al., 2015), children (Rössler et al., 2016), and professional youth teams (O'Brien & Finch, 2016a). In a cluster RCT of the FIFA 11+ in veteran players (minimum age of 32), Hammes et al. (2015) found no preventive effect of the FIFA 11+ on overall injuries. The authors attributed this lack of effect to the low frequency of performed sessions and suggested modifying the program (e.g., adding more ball-based and individual exercises) to better fit the specific implementation context. In recent cross-sectional surveys within professional soccer settings (O'Brien & Finch, 2016a, b), players and staff members also emphasized the need to adapt IPEPs to their specific context. The survey respondents emphasized the need for adequate exercise variation, progression, individualization, and soccer-specificity.

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The importance of understanding the context in which an intervention is to be delivered has been highlighted in recent injury prevention implementation research (Padua et al., 2014; Twomey et al., 2015; Donaldson et al., 2016), as well as in established injury prevention models (Finch, 2006; Finch & Donaldson, 2010). Information on the delivery of IPEPs in professional soccer settings is scarce, but it is known that professional soccer teams strongly support the use of IPEPs and employ similar exercise components (e.g., strength, balance, core stability, and plyometrics) as in established amateur programs, such as the FIFA 11+ (McCall et al., 2014; O'Brien et al., 2016). It is also known that achieving adequate adoption and compliance to injury prevention programs can be challenging in these settings (Bahr et al., 2015).

Professional players, as defined by FIFA (Fédération Internationale de Football Association 2007) earn more than the expenses they occur for soccer activities and have written contracts with a club. In addition to their top-level teams, professional clubs also support youth teams, based in development academies (Price et al., 2004). To date, injury prevention in these professional youth players has received very little research attention (O'Brien & Finch, 2016b), despite knowledge that physiological loads, psychological loads, and injury rates are very high in these settings (Price et al., 2004; Brink et al., 2010). Reported injury incidences in this population range from 2.0 to 19.4 injuries per 1000 hours, with a recent systematic review finding a higher incidence of training injuries in professional youth players, compared to their adult counterparts (Pfirrmann et al., 2016). In comparison, the reported injury rate in amateur male soccer players ranges from 0.8 to 8.5 injuries per 1000 hours (Junge et al., 2002; Owwoye et al., 2014).

The injury prevention landscape in professional clubs differs to that of amateur soccer clubs in terms of training frequency and staffing. Professional teams typically train on an almost daily basis, compete both nationally and internationally, and are supported by large multi-disciplinary teams including soccer coaches, fitness coaches, and physiotherapists. It has been reported that professional teams adapt injury prevention programs to fit their specific context (O'Brien et al., 2016), which aligns with findings from amateur soccer (Lindblom et al., 2014; Frank et al., 2015) and Australian Football (Fortington et al., 2015; Twomey et al., 2015) settings. Unfortunately, there is a paucity of published information exploring exactly how, and why, teams modify individual exercises to fit their specific settings. For example, the fact that professional soccer teams strongly support the use of eccentric strengthening exercises (McCall et al., 2014), but rarely use the evidence-based (and FIFA 11+ advocated) hamstring lowers exercise (Bahr et al., 2015), raises the question

of which alternate exercises they do perform and why. This information is necessary to guide the design and successful delivery of future IPEPs, specifically tailored to the professional soccer context. Accordingly the aims of this present study were:

1. To assess the injury prevention exercises used by professional youth soccer teams, against the industry standard program for amateur soccer, the FIFA 11+.
2. To report the reasons for use, and modification, of individual exercises by professional youth soccer teams

The findings are expected to inform the development of future IPEPs, specifically tailored to the context of professional youth soccer.

Materials and methods

This study was a secondary analysis of a prospective observational study. The selection of participants and data collection methods have been previously reported (O'Brien et al., 2016) and are summarized below. However, the original analysis did not address the use and modification of individual exercises, or the reasons for these modifications, which are the focus of this present paper. The study was approved by the Federation University Australia Human Research Ethics Committee and all participants completed informed consent forms.

Participants

The participants were the soccer coaches, fitness coaches, and physiotherapists from four youth male teams, in a European professional soccer academy. The academy was selected due to existing connections to the researchers. The consent rate was 90% (18 of 20 eligible staff members). All participants were familiar with the FIFA 11+ program from taking part in a previous survey focussing on injury prevention exercise programs and, more specifically, the FIFA 11+ (O'Brien & Finch, 2016a). Furthermore, the primary analysis identified fitness coaches as the primary deliverers of IPEPs in this context, with support from physiotherapists (O'Brien et al., 2016). The teams ranged from Under-15 to Under-23 age groups and typically trained 6–7 times/week in addition to playing a game. The majority of players attended school in addition to their soccer activities.

Data collection

On a weekly basis, across the entire 2014/2015 soccer season, one injury prevention exercise session from each of the four teams was observed by one author (J. O.) and documented on a standardized data collection sheet (O'Brien et al., 2016). To achieve a balance in the number of observations at different time points across the training week, a block randomization method was used, whereby one injury prevention session from the total number of scheduled sessions in the week (as provided by team staff) was selected for observation. When block randomization was compromised (e.g., short-term cancellation of the selected session), one of the remaining sessions in the week was chosen at random using an online generator (www.random.org). Ninety percent of the planned observations were completed (160 of 168) and eight observations were missed due to short-term cancellation by the team staff or the observer being absent (e.g., illness, educational leave).

Data collection sheet

During each observation, the team's use of each individual FIFA 11+ exercise (Fédération Internationale de Football Association 2016) was coded as either "performed", "performed modified", or "not performed". Exercises were considered modified when progressions or equipment, other than those outlined in the original FIFA 11+ (Fédération Internationale de Football Association 2016), were observed. This category was employed to evaluate the extent to which teams used exercises similar to the FIFA 11+. Directly following the IPEP observation, the staff delivering the session (fitness coaches and physiotherapists) were asked to explain the reasons for choosing individual exercises. In cases where FIFA 11+ exercises were observed in modified forms, staff provided reasons for the modifications. The staff members' verbal responses were noted on the data collection sheet. Information on the use and modification of exercises was also gathered at regular staff team meetings.

Analysis

The data from all four teams were combined for analysis. For each individual FIFA 11+ exercise, the proportions of the 160 observed IPEP sessions in which the exercise was "performed", "performed modified", and "not performed", were calculated using Microsoft Excel™. The reasons for including, excluding, and modifying each exercise, as provided by staff members, were entered into a table, structured on the components of the FIFA 11+. The number of staff members providing each reason was calculated.

Results

One hundred and sixty IPEP sessions were observed, which represented 36% of the total number of IPEP sessions performed by the teams across the season and 16% of the total training sessions (in any form) performed by the teams.

Use of individual FIFA 11+ exercises

The proportion of total IPEP sessions in which each FIFA 11+ exercise was coded as "performed", "performed modified", and "not performed" are summarized in Figure 1. The exercises are labeled as in the original FIFA 11+ (http://www.f-marc.com/downloads/posters_generic/english.pdf) and are ranked from left to right in descending order of the proportion performed in original form. The average proportion of sessions in which individual FIFA 11+ exercises were performed in original form was 12% (range across the different exercises 0–33%). The corresponding figure for exercises performed in modified form was 28% (range 2–62%), and for exercises not performed 61% (range 28–98%).

The five most frequently observed FIFA 11+ exercises in their original form, were the "sideways bench" (33%), followed by the "bench", "hip in", "hip out" (each 28%), and "running quick forward & back" (11%) (Fig. 1). The five most frequently

observed exercises in modified form were the "single-leg stance" (62%), "squats" (60%), "running straight" (60%), "bench" (44%), and "jumping" (43%) (Fig. 1). The five most frequently observed exercises, in either original or modified form, were the "bench" (72%), "squats" (69%), "running straight" (68%), "single-leg stance" (66%), and "sideways bench" (64%).

Staff input regarding reasons for the use and modification of individual exercises

The reasons for including, excluding or modifying individual FIFA 11+ exercises, including examples of modifications, are summarized in Table 1. Staff members could provide more than one reason in each category. The number of staff members (from the total of nine fitness coaches and physiotherapists) providing each reason is shown in brackets.

The most frequently provided reasons for modifying exercises were to add variation, progression, challenge, and individualization. Staff perceived these factors to be important for motivating players, avoiding boredom and tailoring the exercises to the different ability levels and situations of individual players. For example, exercises were often modified for players who had recently joined the team or had recently returned to the team following an absence due to injury, illness, or national team participation. Another frequently reported reason for modification was to align the preventive exercises with athletic training goals (e.g., strength and speed) and cognitive training goals (e.g. reaction time and peripheral awareness). For example, squats were performed with added weight to develop strength and players were challenged to react to visual or auditory cues during balance exercises, to add a cognitive challenge (Huijgen et al., 2015).

The first and last sections of the FIFA 11+, the "running exercises", were perceived by staff members as a valuable part of soccer training warm-ups. However, these exercises were considered to be less relevant when the IPEP delivery format was not a warm-up. Particular running exercises (e.g., circling partner, shoulder contact) were often omitted due to the overlap with drills in the (coach-led) technical and tactical sections of soccer training, which involved similar movements and challenges, but with added soccer specificity. In general, the exercises in the middle section of the FIFA 11+, "strength, plyometric and balance" were highly valued by the staff members, who cited their strong evidence-base and relevance to athletic goals. It was emphasized that the volume and intensity of strength and jumping exercises required careful coordination with the volume and intensity of the overall soccer training, along with consideration of

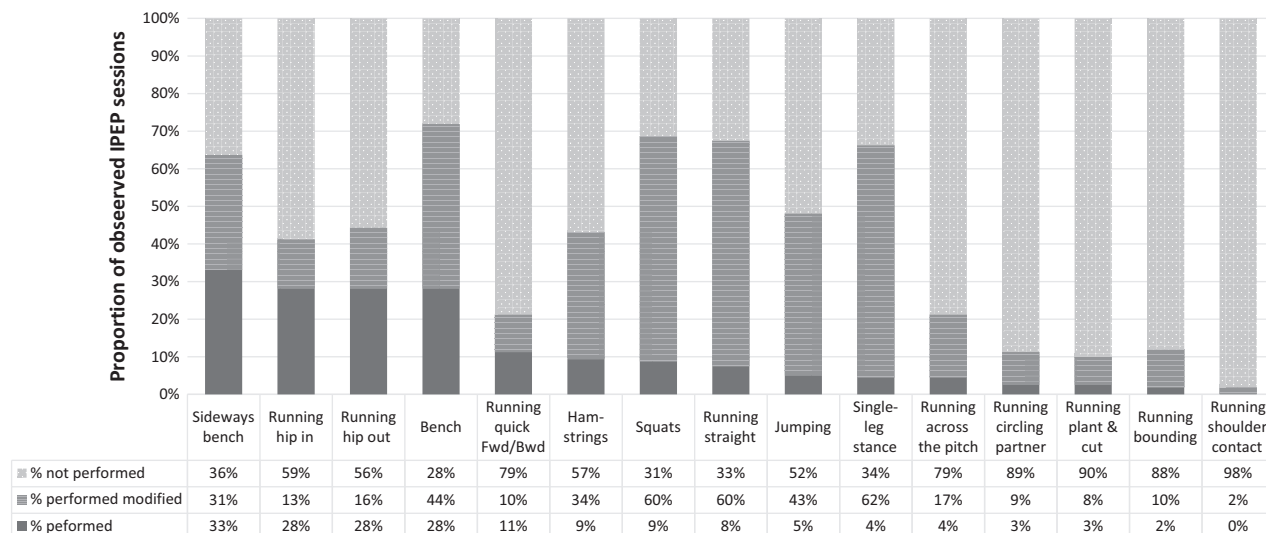


Fig. 1. The proportion of injury prevention exercise sessions ($n = 160$) in which individual FIFA 11+ exercises were performed, performed modified or not performed by four professional youth soccer teams¹.

its timing within the training week, in order to appropriately manage the total physiological load on players. This was particularly challenging in phases of the season with heavy game schedules, in which staff were cautious of player fatigue and overload.

Discussion

This is the first study to assess professional youth soccer teams' chosen injury prevention exercises against the industry-standard FIFA 11+ program. The FIFA 11+ exercises were observed more frequently in modified form (average 28% of sessions) than in their original form (average 12% of sessions). Staff modified exercises to add variation, progression, challenge, and individualization, as well as to tailor the exercises to specific athletic and cognitive training goals. This information is important for the ongoing development and delivery of future IPEPs, specifically tailored to this context.

The FIFA 11+ represents an efficacious injury prevention exercise program, backed by extensive supporting material and dissemination efforts (Bizzini & Dvorak, 2015). However, the program's ultimate real-world impact depends not only on its efficacy (established in RCTs), but also on the extent to which soccer teams adopt and maintain the exercises it contains. When teams modify FIFA 11+ exercises, there is need to understand why they do so, and to consider whether these modifications might impact (either positively or negatively) on the effectiveness of

the program. Recent sports injury research emphasizes that enhancing the implementation of interventions necessitates a detailed understanding of both the individuals delivering the programs, and their specific delivery contexts (Finch & Donaldson, 2010; Saunders et al., 2010; Padua et al., 2014; Twomey et al., 2015; Donaldson et al., 2016). This present study represents an important contribution to describing how, and why, staff members in professional youth soccer teams modify individual IPEP exercises to fit their context. The study's main strengths are the high number of prospectively recorded direct observations, standardized documentation and use of the industry standard IPEP for amateur soccer, the FIFA 11+, as the gold standard comparator.

Five FIFA 11+ exercises ("bench", "squats", "running straight", "single-leg stance", and "sideways bench") were observed, either in original or modified form, in well over half of the IPEP sessions. This aligns with the results of other recent studies, suggesting that certain FIFA 11+ components hold relevance for professional soccer teams (McCall et al., 2014; O'Brien et al., 2016). Importantly, this present study also details the reasons why staff members included, excluded or modified exercises, hence providing novel insights into how IPEPs and their components are adapted to fit a particular implementation context.

Taken together, the above results suggest that IPEPs for professional youth soccer can be structured on the same basic components as the FIFA 11+ (e.g., strength, balance, core stability, and plyometrics), but require tailoring to the delivery context and a high degree of adaptability. Professional youth soccer teams have access to extensive training equipment and the support of multiple staff members. In

¹Images and descriptions of the FIFA 11+ exercises are available at http://www.f-marc.com/downloads/posters_generic/english.pdf. The exercises are ranked from left to right in descending order of the % performed.

Table 1. Staff members' reasons for including, excluding, and modifying individual FIFA 11+ exercises in 160 injury prevention exercise program (IPEP) sessions. The number of staff (from a total of 9) providing each reason is shown in brackets*

Part	Exercise	Reason for inclusion	Reasons for exclusion	Example of observed modifications	Reasons for observed modifications
Running	Running Straight	Low-intensity start (5)	Lack of variation (8) IPEP separate from warm-up (5)	Jogging laps ± cognitive cues Adding sprint technique drills, arm movements and balls Format (e.g., small-sided game, players shoulder-to-shoulder) Inside heel-touch Format (e.g., small-sided game, players shoulder-to-shoulder)	Common practice (5) Acclimatize to surroundings (3) Cognitive and athletic goals (4) Variation and progression (8) Format wears out pitch (2) Variation and progression (6) Cognitive and athletic goals (4) Format wears out pitch (2)
	Hip Out	Low-intensity start (6) Common practice (8) Relevance to soccer (5) Format easy to supervise (2)	Lack of variation (7) IPEP separate from warm-up (5)		
	Hip In	Low-intensity start (6) Common practice (8) Relevance to soccer (5) Format easy to supervise (2)	Lack of variation (7) IPEP separate from warm-up (5)	Outside heel-touch Format (e.g., small-sided game, players shoulder-to-shoulder)	Variation and progression (6) Cognitive and athletic goals (4) Format wears out pitch (2)
	Circling Partner	Train peripheral awareness (2) Format easy to supervise (2)	Lack of variation (4) IPEP separate from warm-up (3) Performed in soccer drills (6)	Circling cones Different formats (e.g., small-sided game, two-lane race)	Variation, progression and challenge (3) Cognitive goals (1) Format wears out pitch (2)
	Shoulder Contact	N/A†	Lack of variation (3) IPEP separate from warm-up (4) Performed in soccer drills (5)	Format (e.g., small-sided game)	Variation, progression and challenge (2) Cognitive goals (1) Format wears out pitch (2)
	Quick Fwd/Bwd	Relevance to athletic (speed/agility) goals (4) Format easy to supervise (2)	Lack of variation (6) IPEP separate from warm-up (5) Performed in soccer drills (5)	Format (small-sided game, speed ladder race)	Variation, progression and challenge (6) Cognitive and athletic goals (2) Format wears out pitch (2)

Table 1. (continued)

Part	Exercise	Reason for inclusion	Reasons for exclusion	Example of observed modifications	Reasons for observed modifications
Strength Plyometrics Balance	Bench	Common practice (6) Evidence base [†] (6) Relevance to soccer tackling (5) Relevance to athletic core stability goals (6) Common practice (6) Evidence base [†] (6) Relevance to soccer tackling (5) Relevance to athletic core stability goals (6) Evidence base [†] (8) Injury statistics – common injury in older age groups (4)	Lack of variation (4) Too static in warm-up (3) Pitch conditions-cold/wet (5)	Caterpillar walks and push ups Use of Swiss balls, medicine balls, slings and elastic bands Partner exercises Throwing, catching	Variation, progression, challenge and individualization (8) Cognitive and athletic goals (4)
	Sideways Bench		Lack of variation (4) Too static in warm-up (5) Pitch conditions-cold/wet (5)	Use of Swiss balls, medicine balls, slings and elastic bands Adductor side bench [‡] Partner exercises Throwing, catching, kicking	Variation, progression, challenge and individualization (9) Cognitive and athletic goals (5) Soccer specificity (6)
	Hamstrings		Lack of variation (6) Injury statistics – rare injury in younger age groups (3) Isokinetic data – deficits rare in younger age groups (3) Risk of neuromuscular fatigue, DOMS [†] (5) Risk of injury (2) Managing high-intensity load (4)	Dead-lifts and hip-thrusts Use of Swiss balls, slide-boards and weight machines	Variation, progression, challenge and individualization (9) Athletic goals (7) Risk of neuromuscular fatigue, DOMS [†] and injury (4)
	Single-Leg Stance	Evidence base [†] (3) Relevance to soccer (7)	Lack of variation (7) Too static in warm-up (6) Not an athletic priority (2)	Use of unstable surfaces Different formats (e.g., parkour, motor skills park) Partner exercises with volleys, headers and cognitive cues Use of weight-training equipment Lunge variations Decline squats	Variation, progression, challenge and individualization (8) Cognitive and athletic goals (9) Soccer specificity (7)
	Squats	Evidence base [†] (7) Relevance to soccer and athletic goals/training cycle (6) Evidence base [†] (5) Relevance to soccer and athletic goals/training cycle (7)	Lack of variation (4) Managing high-intensity load (5) Lack of variation (7) Managing high-intensity load (6)	Use of boxes, unstable surfaces, hurdles and hoops Partner exercises with volleys, headers and cognitive cues	Variation, progression, challenge and individualization (9) Athletic goals (8) Decline unloads ankle joints (2) Variation, progression, challenge and individualization (9) Cognitive and athletic goals (6)
	Jumping				

Table 1. (continued)

Part	Exercise	Reason for inclusion	Reasons for exclusion	Example of observed modifications	Reasons for observed modifications
Running	Across the Pitch	Relevance to soccer and athletic goals/training cycle (2) Format easy to supervise (2)	Lack of variation (6) Performed in soccer drills IPEP separate from warm-up (5)	Combined with bounding, jumping, agility and cognitive exercises	Variation, progression, challenge and individualization (5) Cognitive and athletic goals (4)
	Bounding	Relevance to soccer and athletic goals/training cycle (3) Format easy to supervise (2)	Lack of variation (7) Performed in soccer drills IPEP separate from warm-up (5)	Use of hurdles Diagonal bounding	Variation, progression, challenge and individualization (6) Athletic goals (4)
	Plant and Cut	Relevance to soccer and athletic goals/training cycle (2) Format easy to supervise (2)	Lack of variation (6) Performed in soccer drills IPEP not delivered as warm-up (6)	Use of Bungee cords Format (e.g., small-sided game, partner challenge, in sand)	Variation, progression, challenge and individualization (4) Cognitive and athletic goals (1)

*Participants could provide more than one reason.

†This exercise was not observed in its original form.

‡Evidence base refers to participants' perception that an exercise's preventive effect was supported by trial reports in sports-medicine or sports-science journals.

§An exercise in the sideways-bench position with the upper leg supported, aimed at training the hip adductors (Ishoi et al., 2015).

¶Delayed Onset Muscle Soreness.

this context, IPEPs are delivered by educated fitness coaches and physiotherapists, with an awareness of the published literature relating to injury prevention in soccer. These individuals require IPEPs with more variation, progression, challenge, and individualization than standard programs such as the FIFA 11+. In view of their specific implementation context, the staff of professional youth teams would perhaps be better served by clear, evidence-based guidelines on the essential ingredients of IPEPs that provide sufficient flexibility regarding the delivery format, location and selection of individual exercises.

In the field of implementation science, the concept of a program's core intervention components is well-established. Fixsen et al. (2005) defined these as the aspects of a program which are essential and indispensable in achieving the desired outcome. When translating evidence-based interventions to different real-world settings and populations, the core implementation components need to be upheld, whereas other, less essential aspects of the program can be tailored to better fit the local context. Applying this concept to the FIFA 11+, it can be hypothesized that the program's core intervention components are the elements of strength, balance, core stability and plyometrics. It is noteworthy that other IPEPs, containing similar components to the FIFA 11+, but different individual exercises, have also demonstrated efficacy in large-scale RCTs (Mandelbaum et al., 2005; Emery & Meeuwisse, 2010; Waldén et al., 2012). This supports the notion that, as long as core components are maintained, a certain degree of exercise modification is possible without jeopardizing an IPEP's injury prevention effect. Two recent systematic reviews and meta-analyses both found strong evidence for the preventive effect of IPEPs, while also identifying specific program components which appeared particularly important in achieving success (Lauersen et al., 2014; Rössler et al., 2014). In a review of studies with heterogeneous populations and interventions, Lauersen et al. (2014) identified strength and balance components as being particularly important to the success of IPEPs. The second review, focussing more specifically on IPEPs in athletes under 19 years of age (Rössler et al., 2014), concluded that IPEPs can reduce injuries by around 46%, with those programs including jumping exercises appearing most effective.

In addition to establishing which core elements should be included in the content of IPEPs, there is a pressing need to define the essential aspects of successful IPEP delivery and support. These have been referred to, in the field of implementation science, as "core implementation components" (Fixsen et al., 2005), and typically relate to aspects of the staff who deliver interventions and organizational support. Unfortunately, many published reports on IPEPs in team ball sports fail to identify IPEP deliverers

(O'Brien & Finch, 2014b) and other key implementation aspects (O'Brien & Finch, 2014a). The results of this present study highlight important aspects relating to the staff delivery of IPEPs in professional youth soccer. As fitness coaches are the primary deliverers in this context, the success of programs will be influenced by the injury prevention beliefs, training goals and planned training cycles of these individuals. The direct input of staff members in this study suggests that IPEPs which harmonize with athletic training goals and which contain a high level of variation, progression, and individualization, will be more likely to be implemented in professional youth soccer settings.

Study limitations

As this study was conducted in the specific real-world context of one professional soccer academy, care is warranted in extrapolating the results to other populations and settings. Although a high number of IPEP sessions were observed, over multiple time points, only one author performed the observations and the coding of FIFA 11+ exercises as "performed", "performed modified" or "not performed" proved challenging at times. Although IPEP sessions were randomly selected for observation, only one-third of the teams' total IPEP sessions were observed and it is possible that the behavior of the teams differed in the unobserved sessions. This study focussed on injury prevention exercises, but other injury prevention strategies, including managing match and training load, are also important considerations in professional football (McCall et al., 2014). As both the number of staff members present at each IPEP session, and the frequency in which individual exercises were performed, varied considerably, it is possible that the reasons for exercise use and modification were not equally represented across individual staff members or individual FIFA 11+ exercises. The data collection sheet did not undergo formal validity or reliability testing (beyond face validity), but was structured on industry-standard, FIFA 11+ program.

Future research

As IPEP deliverers frequently use modifications of established exercises, there is a need to establish which aspects of programs represent the essential core intervention components, as opposed to the non-essential aspects which can be modified without jeopardizing program fidelity. In view of the challenge of implementing IPEPs alongside heavy game schedules and other training priorities, there is need to define the minimum dosage of core IPEP components that is needed to achieve (and maintain) injury prevention effects. In implementation science, this is known as the adaptation vs fidelity challenge (Fortington et al., 2015).

Perspectives

This study adds to a growing body of recently published research (Lindblom et al., 2014; Fortington et al., 2015; Frank et al., 2015; Donaldson et al., 2016) highlighting the key role of successful implementation in preventing sports injuries. Employing the industry-standard FIFA 11+ program for amateur soccer as the comparator, the findings shed light on the use and modification of injury prevention exercises in professional youth soccer. The direct observations of IPEPs, in combination with input from staff members, demonstrates how and why end-users modify program to fit their specific context. This information will inform both researchers and practitioners aiming to enhance the real-world impact of IPEPs in professional soccer settings, while also holding relevance for IPEP implementation in other team ball sport settings.

Key words: Sport, injuries, training.

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Competing interests

W. Y. and C. F. F. have no conflicts of interest that are directly relevant to the content of this article. J. O. is employed at the professional soccer academy involved in this study. It is possible that the author's relationship with academy staff influenced the results.

Contributorship statement

J. O. led this work as part of his PhD studies. He designed the study, led its conduct, had the major role in paper writing and is responsible for the overall content. W. Y. and C. F. F. contributed to the design of the study, analysis of data, and the writing of the article.

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