An Exploration of the Landscape of Fundamental Movement Skills and Strength Development in UK Professional Football Academies

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Abstract

The purpose of this study was to investigate the landscape of Fundamental Movement Skills (FMS) and strength development in professional football (soccer) academies in the UK. To achieve this, we interviewed 16 participants, whose primary responsibility was the physical development of youth players from a variety of Elite Player Performance Plan (EPPP) categorised academies. Following abductive analysis, we identified that whilst all participants acknowledged the importance of FMS and strength development for young football players, there was variance across EPPP categories relating to: (a) the time dedicated to developing FMS and strength; (b) the number, level of qualification, and utilisation of staff; and (c) the integration of the evidence informed practice into programme design and delivery. Although the key foci of academy strength and conditioning programmes generally prioritised injury reduction, performance improvement, and building a physical base for future development, the methods used to achieve these outcomes were varied. Finally, participants reported how relationships between support staff and technical coaching staff had a direct impact on the implementation of FMS and strength programmes. We have provided rich insights into a range of factors that may facilitate or hinder FMS and strength development within youth football players and thus helped to advance understanding of the practical implications of focusing on these key skills within athlete development programmes.

Key Words: Strength and conditioning, athlete development, youth sport, performance, injury prevention

Introduction

It has become widely agreed that Fundamental Movement Skills (FMS) should be considered as motor skills that are classified into three distinct categories: *locomotion* (involving locomotion of the body, such as running); *object control* (manipulative skills, such as catching a ball); and *stability skills* (such as balancing).[1] The skills that fall into such categories are considered as the building blocks of specialized movement sequences, and the mastery of such skills is thought to contribute directly to youth's physical, cognitive, and social development.[2] Seefeldt[3] previously indicated that children who do not master the building blocks of movement are likely to experience a proficiency barrier that will prevent them from learning more complex skills and engaging in sports and games, resulting in lower levels of physical activity.[4] Given that FMS are thought to provide the foundation for an active lifestyle, and may maximise the chances of efficient functional sports skills development, it appears necessary to provide all children with opportunities to develop FMS competence.[5] This is particularly pertinent for adolescents participating and competing in open-skill, invasion sports, such as football (soccer), where the need to produce coordinated movements and develop a range of functional motor skills (e.g., passing, shielding, changing direction) is imperative to individual success.[6]

In addition to FMS, Lloyd and Oliver[7] have advocated the benefits of all children developing *strength* for both the production and maintenance of healthy bodies as well as the augmentation of sporting performance. Indeed, researchers have argued that strength and FMS should not be seen as mutually exclusive, but instead as interconnected constructs that are developed together in order to support the growth of robust athletes (e.g., Cattuzzo et al.[8]). Despite concerns previously being raised about the possibility for strength training to damage adolescents' growth mechanisms with subsequent life-lasting effects, researchers have highlighted that regular participation in strength training can (amongst other things): improve cardiovascular risk profiles, strengthen bone, improve motor performance skills and increase a young athletes' resistance to sport-related injury.[9,10] Consequently, it would appear that

appropriately structured and delivered training programmes for adolescents should include methods that equally target both FMS and strength.[8]

Enhancing the physical abilities of children throughout childhood and adolescence to maximize health and athletic success at an adult age is not a novel concept.[11] Children are, however, now specialising in sport at younger ages and thus the *race to the bottom* to identify, recruit and develop young people within a specific sport is occurring earlier within a child's lifespan.[12] Specifically, in football in the UK, the introduction of the Premier League's Elite Player Performance Plan[1] (EPPP) in 2012 has resulted in children beginning their formal training earlier and having more coaching time at clubs as part of their development.[13] However, numerous possible consequences of this early specialisation have been highlighted, including: increased rates of sport-related injuries, burnout, and reduced motor skill development.[14,15] While the EPPP recommends that young players have access to multi-sport activities and strength and conditioning provision to help develop physical literacy and a variety of movement skills to counter issues associated with early specialisation, it is currently not clear whether clubs are implementing such approaches. Thus, given the increases in time that children spend in formal club academies, and the multiple benefits of developing FMS and strength from a young age[2,5,6], it would seem imperative to examine what professional football academies (who are governed by the EPPP) are currently doing to develop such physical qualities in their young athletes, particularly in the Foundation Phase (e.g., 8-12 year olds). Indeed, Jukic et al.[16] suggested that FMS competence may be associated with higher levels of technical performance in football and, consequently, football clubs should have a vested interest in developing them within their players.

Researchers have begun to highlight the increasing importance being placed on resistance

[1] The EPPP was introduced in 2012 by the Premier League and key stakeholders. The EPPP was designed to structure and improve the accountability of professional club academies with the mission of producing more and better home-grown players (see https://www.premierleague.com/youth/EPPP).

training and FMS development by a range of academy staff (e.g., coaches, sport scientists) in elite football.[13] Albeit focusing specifically on the benefits of FMS and strength training for injury prevention, Read et al's [13] findings offer some indication that the culture of elite youth football development is shifting. This is particularly poignant considering the cultural and societal changes that have reduced children's informal physical activity (e.g., play) and thus the somewhat natural development of FMS, strength, and subsequent general athletic motor skills in early years.[17] Given the detrimental impact that this may have on youth's health and sporting performance, sports clubs, particularly those governed by the EPPP in football, are likely to have to bridge the gap in the FMS and strength needed to perform effectively in the sport.

Researchers have previously reported that youth team football coaches were not aware of the latest recommendations and guidelines regarding strength training for young players.[18] One potential avenue for professional football academies to facilitate the development of FMS and strength in young players, therefore, would be to ensure that they engage with a research-informed curriculum to increase knowledge and to provide training to ensure that relevant staff maximise development opportunities.[19] For example, helping staff to understand the importance of the quality and proficiency of movement (and how these are developed), rather than simply the product of the movement (e.g., movement outcome), will help to facilitate the increased likelihood of a player delivering a successful outcome (e.g., maximal running speed). There appears, however, to be a dearth of literature that examines current practices of professional football academies and thus it is difficult to understand the overall landscape of the application of FMS and strength training.

In an attempt to address the aforementioned issues, the purpose of this study was to investigate what professional football club academies are currently delivering to help develop FMS and strength in youth players. Specifically, we aimed to: (a) investigate the current integration of FMS and strength training within a representative sample of professional football club academies, particularly at Foundation Phase, exploring how these attributes are developed

across different academy levels (EPPP categorises academies [Levels 1-3] based on the infrastructure and level of player support and development the academy provides – see https://www.premierleague.com/youth/EPPP); (b) examine whether football academy FMS and strength programmes are sufficiently evidence-informed; and (c) investigate the impact of FMS and strength training programmes and how they are measured. In attending to these aims, we seek to inform coach education programmes in attempts to facilitate better knowledge and application of theoretically underpinned training regimens that focus on FMS and strength.

Methods

Research Design

In line with the aims of this study, and the paucity of research that has explored the landscape of FMS and strength development in professional football academy practice, an exploratory approach was adopted (cf. Stebbins,[20]). This approach emerged from a *critical realist* philosophical stance, which focuses on the idea that researchers perceive that an objective world exists independently of individuals' perceptions, yet within that world knowledge is also comprised of subjective interpretations that influence the way in which the world is constructed.[21, 22] Consequently, critical realists reject the single dichotomy perspective between positivists and constructivists by combining aspects of both.[23] Specifically, this philosophical position allowed us to explore the mechanical aspects of FMS and strength training employed in the sampled EPPP football academies, whilst also gaining an in-depth understanding of the factors that underpinned participants' decision making and practice.

Participants

Participants were sampled purposively (cf. Patton,[24]) under the premise that: (a) they were currently working in one of the 85 EPPP categorised professional football academies (EPPP Category 1 clubs, $n = 24$; EPPP Category 2 clubs, $n = 21$; EPPP Category 3 clubs, $n = 40$ – as of 2019); and (b) their primary responsibilities included the physical development of youth players from the Foundation Phase upwards. The final sample consisted of 16 males who were working

within the academy systems of professional football clubs in the UK (EPPP Category 1 clubs, *n* = 6; EPPP Category 2 clubs, *n* = 5; EPPP Category 3 clubs, *n* = 5). The participants fulfilled different roles, including: Head of Department (*n* = 9), Fitness/Strength and Conditioning Coach (*n* = 6), or Academy Performance Scientist (*n* = 1) and had experience of working in professional football ranging between 2-18 years ($M \pm SD = 6.9 \pm 4$). Participants were educated to undergraduate (*n* = 16), postgraduate (*n* = 11), and/or Ph.D. (*n* = 1) level, with three participants being British Association of Sport and Exercise Sciences (BASES) accredited Sport and Exercise Scientists, two certified by the UK Strength and Conditioning Association (UKSCA), one certified by the National Strength and Conditioning Association (NSCA), and a further three participants working towards those professional qualifications.

Data Collection: Interview Guide

Through the position of critical realism, researchers view reality as a stratified system of emergent entities.[25] These entities offer an understanding of meaning and reason (e.g., causal explanations), which are established through in-depth approaches to data collection that consider individual experience.[25] Following the recommendations of Fletcher, [26] and in line with the aims and philosophical stance of our research, therefore, data were collected via semi-structured interviews (Patton,[24]). The interviews were supported by an interview guide (available on request), which was constructed based on the extant literature and the aims of the study, and contained main questions (e.g., “How important do you think FMS are for performance in football?”) and a series of neutral, non-directional probes (e.g., “Why do you think this is?”). The interview guide consisted of six main sections. First, participants were asked a series of introductory questions designed to settle them into the interview and to get them thinking about the main concepts under investigation (e.g., “What is expected of you in your day-to-day role?”). Second, participants were asked about the nature and importance of FMS and strength training, and how these were currently integrated into the player development programmes at their respective clubs, particularly in the Foundation Phase (e.g., “How does your club

specifically target the development of FMS and strength within the academy system?"). Third, participants were asked to discuss their approaches to measuring the development of FMS and strength (e.g., "What results have you seen as a result of implementing your programmes?"). The fourth section focused on FMS and strength programme implementation in the participants' respective clubs, considering the human and physical resources available (e.g., "How are training schedules designed and communicated to those responsible for delivery?"). Fifth, a series of concluding questions were posed, which focused on participants' advice regarding FMS and strength training in youth player development (e.g., "What advice would you give to others regarding FMS development?"). The final section considered the trustworthiness of the interviews, allowing the participant to reflect on whether they were able to tell their whole story in a non-directed manner (e.g., "Do you feel as though you were led or influenced in any way?"). The efficacy of the interview guide for attending to the aims of the study was tested through two pilot interviews with matched participants (both from EPPP Category 2 academies; cf. Patton,[24]). Following participant feedback, the interviewer's reflections and discussions with the research team, minor modifications were made to the order and phrasing of questions.

Procedure

On receiving Institutional Ethical Board approval, the sample was obtained by contacting professional club academies (n = 25) categorised in the EPPP via email and inviting those members of staff who met our sampling criteria to participate. Those who agreed were asked to provide written, informed consent prior to commencing their participation, all of whom did. Interviews were conducted at a time and location to suit the participant, and either done face-to-face away from the participants' place of work to avoid potential bias caused by environmental coercion[24], (n = 2) or via Skype™ (n = 14) due to geographical and access issues. Interviews lasted between 40 and 73 minutes ($M \pm SD$ = 55 ± 10), were audio recorded in their entirety, and transcribed verbatim yielding 242 pages of single-spaced transcript. Copies of transcripts were

sent to each participant in an attempt to verify that the transcript offered an accurate account of the interview discussion (cf. Tracy,[27]); all participants replied indicating that they were.

Data Analysis

In accord with our critical realist stance, data were analysed using an abductive approach.[26] Specifically, abduction facilitated our inductive exploration of the content of the data while recognising that we brought existing (deductive) knowledge of theoretical frameworks of FMS and strength training to the data analysis procedure. Further, this process allowed us to explore the mechanisms (e.g., knowledge; motivation; impact) that may improve understanding of the participants' experiences of FMS and strength development in academy football (cf. Fletcher,[26]). To actualise this, the data analysis process, guided by Braun and Clarke's [28] framework, followed six main steps. Further, to manage methodological rigour and enhance the critical realist position of *judgmental rationality*[21], the principles of *empirical adequacy*, *ontological plausibility*, and *practical utility* outlined by Ronkainen and Wiltshire[29], were adhered to. This was achieved by employing Tracy's[27] *big tent* criteria and Smith and McGannon's[30] *critical friend* approach (see Table 1 for full procedure).

INSERT TABLE 1 HERE

Results

The results section has been structured using the following thematic focus: (a) integration of FMS and strength; (b) the evidence- informed nature of practice; and (c) measurement and impact of FMS and strength programmes. The findings contain a series of raw quotes to allow immersion within the participants' experiences, as well as a range of tabulated data designed to provide an overview of the current landscape of the focus placed on FMS and strength in different football academies and provide the opportunity for comparisons to be made across Category levels (see Table 2). Only one participant reported that the academy that he currently worked for (Category 3) placed no focus on FMS and strength development at the Foundation Phase of the academy due to a number of constraints (e.g., human and financial resource). Data

from this participant are, therefore, only included where appropriate in an attempt to provide an overview of the landscape of academy practice.

INSERT TABLE 2 HERE

a. Integration of FMS and Strength

Functional integration. Fifteen participants in this study reported that their clubs placed considerable importance on adopting an integrated approach to developing FMS and strength. Specifically, participants detailed the use of the warm-up and carousel/circuit practices to focus on both FMS and strength development in football-related activities. For example, participants stated, “The fundamental movement skills we focus on are very specific to the football environment. We work in a forward-thinking manner taking those fundamental movement skills and putting them in a football context. Everything we do is in a football setting”, and, “From a player and coach’s perspective, it’s important for me (Academy Performance Scientist) being seen as part of football. I would say the department (Sport Science) is seen as an extension of football as opposed to football’s out there, the gym is in here.”

Some participants reported that integrating FMS and strength development into football specific practices had been a particular challenge. For example, participants acknowledged, “I had to shift my philosophy and my thoughts on certain things. I think a lot can be done on the pitch and within their (players) football sessions to develop strength and movement quality”, and, “One of the biggest challenges is trying to deliver it (FMS) in a way that’s engaging or even in disguise. It’s how you package the delivery of FMS so players will engage, that’s the difficult thing.” Accordingly, many of the participants (n = 10; three Category 1 academies, four Category 2 acdemies, three Category 3 academies) discussed the importance of the functionality of movements and the transference of FMS and strength into a football context with the players requiring the ability “to apply these components” and being “robust enough to deal with the demands of the game.” Thus, the need to “build programmes around the context of the game and in an integrated environment” was considered to be an important factor.

Only a limited number of participants (*n* = 2; one Category 1 academy, one Category 2 academy) reported providing additional stand-alone sessions to develop physical skills away from football specific sessions. These participants highlighted that the sessions were used to focus on the development of FMS, strength and other components (psycho-social) to help the players' development.

Multi-sports. The majority of participants (*n* = 14; five Category 1 academies, four Category 2 academies, five Category 3 academies) identified the wide-ranging benefits of utilising a multi-sport approach (e.g., a multi-sport athlete can be defined as a player that participates or competes in two or more sports) on the development of FMS and strength, as well as the wider impact of multi-sports on player development. This is best summarised by one participant who stated, "My message would be to encourage the adoption of a multi-sports approach. I think there's plenty of evidence to state it's beneficial. If you look at practice histories of elite-level performance, a multi-sports approach is the way to go."

For a variety of reasons (e.g., limited time and resources), a number of participants reported that their clubs (*n* = 11; two Category 1 academies, four Category 2 academies, five Category 3 academies) could not include the use of multi-sports in their programmes but were, nevertheless, strong advocates of the approach and actively encouraged engagement in multi-sports outside of their academy programmes. For example, "We think that multi-sports are hugely important for physical development, but the club come from a standpoint that contact time is limited from a football perspective so we can't offer a multi-sport session. We actively encourage players to do them outside", and, "We see our best players or the players with the best fundamental movement skills are generally the players that have exposure to other sports." In addition to multi-sports, half of the participants (*n* = 8; two Category 1 academies, two Category 2 academies, four Category 3 academies) reported prescribing their players "movement homework". For example, one participant stated, "We can't work on all their movement dysfunctions within the session because we have so many athletes with individual needs, so with

homework we can tailor different individual corrective exercises that we'll want them to do three times per week."

Factors impacting delivery of FMS and strength training. A number of sub-themes were constructed relating to those factors that impacted on the type and quality of FMS and strength training, including: (a) time; (b) facilities and resources; (c) human resources; and (d) the importance of interpersonal relationships to enhance coach buy-in to a focus on FMS and strength development. One factor frequently discussed by participants (n = 10; three Category 1 and 2 academies, four Category 3 academies) was the limited amount of *time* that they had with the players (see Table 2). For example, one participant reported, "A lot of people will say that they're (players) coming in to play football, so that can make things quite difficult in terms of finding time to deliver other aspects of their development." Linked to this, participants acknowledged that the lack of contact time had the potential to influence their status with the players, "You've got twenty minutes every other week, so they're (players) getting forty minutes' worth of contact time a month. Players may think 'I don't know what his part is; I don't really know what he wants off me'." Many participants (n = 11; three Category 1 academies, four Category 2 and 3 academies) reported that having more time and access to the players would improve their physical development programmes and enable them to "have a bigger impact on developing the players' physical skills", but this was often limited due to the amount of contact time the technical coaches required and was more evident at the lower Category clubs:

> I've worked in Category 2 teams as well (now at Category 1), so I'm wondering whether the lower down you get they (players and coaches) go in just to play football. They probably don't train anywhere near as much as some of the clubs that can afford to put on more training sessions, so they probably prioritise the football (over movement skills).

The second sub-theme concerned *facilities and resources*. Five participants (one Category 1 academy, two Category 2 and 3 academies) discussed that access to, and the quality of the facilities were a limiting factor that effected their ability to develop players' FMS and strength.

Specifically, one participant's thoughts summarised those of others, "The key things you've got to have are a facility that's safe and effective for you to work in. So if you haven't got a facility where you can do meaningful work, you're always battling."

The third sub-theme relating to those factors thought to impact on the delivery of FMS and strength training was *human resources*. Many of the participants in the study (n = 10; five Category 1 academies, two Category 2 academies, three Category 3 academies) commented on the impact that staffing had on provision and ultimately the players' FMS and strength development. For example, participants reported, "I think the programme's been hit this year by a shortness of staff, which brings difficulties because the level of detail we're talking about now takes a lot of planning and takes coaching", and, "They're (players) moving better, the injuries are going down, their performance scores are going up - imagine what we could do if we had our own facility or extra staffing!" Related to this, participants linked staff shortages to the overall effectiveness of the player development programme, "It's (FMS and strength training) more difficult to do with less staff, I think there's good things that come with less staff in terms of the message doesn't get diluted, but more staff that are on the same wavelength would create a better programme." All participants described their club's staffing structure, with several participants discussing the rationale for placing certain support staff (e.g., depending on levels of experience) with certain age groups (e.g., foundation phase) and the impact that this had on player development. This situation, is best summarised by the following insight:

> What tends to happen is they (younger age groups) get given the intern, the new grad who has very little applied coaching skills. I think then that then becomes a difficult position for the practitioner and for the players to actually develop those skills (FMS) because the practitioner has not refined their delivery skills. That's a barrier.

Alternatively, one participant detailed how his club (Category 1) had taken a different approach to staffing by placing more experienced practitioners with the younger age groups:

I think that's really key, not having your least experienced member of staff working for younger age groups. You're developing these fundamental movement skills that are going to be the building blocks of what they're going to use for the rest of their career. If you get the first bit wrong you're going to have knock on consequences.

Regarding the final sub-theme, 15 of the participants acknowledged the importance of *buy-in* from the technical coaches, which was suggested to be improved through the relationships between coaching and support staff, "The coach has to support the programme and that comes through the trust they have in us as support staff." Further, participants highlighted the significance that technical coach attitudes may have on both the physical development programme and associated player buy-in. The one participant where there was no physical programme for the foundation phase acknowledged the importance of coach and player buy-in but related this to their older age groups when their physical programme began, "Whenever the coach doesn't really buy into it (physical development programme), then quite often the players don't buy into it … The parents will think exactly the same." Another stated, "If they (coach) don't see a relatability to what they're doing they might not buy into it or put effort into it. So staff buy-in is definitely important." Additionally, most participants believed that their "relationship with the technical staff had improved over time" even though at first "there was a little bit of resistance." This resulted in a growing acceptance of participants' roles and was considered to be a significant contributor to the progress of physical development programmes.

b. Evidence-Informed Nature of Practice

All participants demonstrated an in-depth knowledge of FMS and strength, their impact on performance, and how they are incorporated into their football programmes. Participants stated that their knowledge of these concepts came primarily from their formal education (e.g., undergraduate degree). Accordingly, participants emphasised the importance of scientific research for designing, planning, evaluating, and constantly updating evidence-informed physical development programmes. Specifically, one participant acknowledged, "Research on

movement skills is fully integrated into my programme. We're adaptable and open-minded in the way we approach things. If we feel something is successful we will look elsewhere to try educate ourselves and improve what we're doing." Although participants referred to a range of scientific models (e.g., Youth Physical Development Model; Lloyd & Oliver,[7]) and fields of study (e.g., ecological dynamics), the range and depth of research used to underpin programme design and evaluation, as reported by participants, varied from club-to-club. Access to, and use of, scientific evidence ranged from clubs employing a Head of Research and hosting Research Centres, to individuals undertaking their own research projects, and others accessing information via social media platforms. For example, "In terms of research at times it is bordering on us doing too much to be able to integrate it all in a timely manner", and, "Twitter's a massive forum, quite a lot of UKSCA members are on there so I'm always on there looking at what others are doing at the moment."

The value of both formal and informal continual professional development (CPD) was discussed by all participants, with many undertaking a range of activities (e.g., formal education; observations of other practitioners); "I think pretty much everyone's involved in something, some type of external CPD that's keeping moving forwards whether it be PhDs, UKSCA accreditations, all manner of different types of courses and accreditation that are out there", and, "We have a generous CPD budget and have an internal and external event each month which is enjoyable and beneficial." Experiential learning was also highlighted as being key to helping participants to develop effective programmes and practices. This is best summarised by the following participant statement, "A lot of it (effective programme delivery) is about coaching skills, coach and player interactions and how you can improve yourself as a coach using different types of feedback and this comes from doing the job."

c. Measurement and Impact of FMS and Strength Programmes

Measurement. Participants reported the use of fitness testing and movement screens for two main reasons: (1) to measure performance so that feedback could be provided to key

stakeholders (e.g., technical staff, players, parents); and (2) to monitor injuries and rehabilitation. Participants detailed that the main components they measured were: strength (n = 10; three Category 1 and 2 academies, four Category 3 academies); FMS (n = 8; four Category 1 academies, three Category 2 academies, one Category 3 academy); speed (n = 7; three Category 1 and 3 academies, one Category 2 academy); and agility (n = 3; one from each academy Category). A number of participants (n = 4; one Category 1 academy, one Category 2 academy, two Category 3 academies) reported that they did not complete any formal testing (at foundation phase) as part of their programmes but did video record and monitor FMS, and subjectively observe the players during training sessions and games. These experiences were best summarised in the following statement, "In the foundation phase we only did the fundamental movement screen once this year. We realised how much time it took and that we lacked the manpower to be able to action the data." Reports relating to the frequency of measurement also varied. Some participants indicated that measurements were taken at the start and end of the season (n = 3; one from each academy Category), whereas others took measurements three (n = 6; two Category 1 academies, one Category 2 academy, three Category 3 academies) or four times per-year (n = 3; two Category 1 acadamies, one Category 2 accademy) to assess players progress.

Impact. All fifteen participants who implemented FMS and strength programmes emphasised the positive impact that their programmes had on player development. Invariably, the impact of these programmes were related to both performance and injury prevention. Specifically, "Everyone is different, but they (players) improve, undoubtedly. I know just observationally they improve quite a lot in comparison to the non-football population", and, "You can definitely tell when a new player comes in from a different environment, the difference in how they move between them and existing players is huge and that's as a result of the quality and focus of our programme." The importance of trying to maintain correct movements and reduce injuries was discussed by many of the participants. For example, "There's a lot of correlation between good movers and those who are more athletic and perform

410 better but also those players are less likely to get injured." Further, participants identified that
411 focusing on developing players' FMS and strength enabled them to increase training frequency
412 and allowed players to train at improved intensity levels, which subsequently transferred to
413 players' performance, "Because players are getting proper athletic development sessions they're
414 coming in and the staff were all saying, they're athletes, they seem a lot bigger, they seem a lot
415 more athletic, a lot stronger, more powerful", and, "Academy players coming through in the last
416 ten years are definitely better movers - technically better, physically better, faster and better at
417 changing direction, probably because of the physical development programmes coming in."
418 A number of participants (n = 7; two Category 1 and 3 academies, three Category 2
419 academies) acknowledged the long-term vision of their physical development programmes
420 (especially at foundation phase), highlighting the importance of physically "getting the basics
421 right" and "building a base" to help give players the best chance to progress to the next academy
422 phase and ultimately progress successfully into the first team. Specifically, "Now we've
423 regularly got players in the first team and previously there's never been any. These players have
424 been in the programme for a long time and there's never questions as to whether they can
425 physically cope with that level." Accordingly, many participants recognised that it "may take a
426 few years to see the full benefits" of the physical development programmes, but the importance
427 of, "trying to lay the foundations as early as possible."
428 Despite the overwhelming positive nature of the reports regarding the impact of the
429 programmes, some participants did highlight a range of issues associated with the physical
430 development of young players and the related demands placed upon them. For example, "We
431 encourage players to go and do different things and the parents come back and saying, 'We don't
432 have time!' You also get the odd player that doesn't see the point in it (physical development
433 programme)", and, "The negatives are associated with managing player loads. Invariably the
434 good players at a football club will be the good player at school, and so there will be high
435 demand for that player. Management of player is the biggest challenge."

Discussion

The purpose of this study was to investigate the landscape of FMS and strength development in a representative sample (e.g., across EPPP categories) of professional football academies in the UK, particularly in the Foundation Phase. This study was exploratory in nature and designed to give an overview of current practice at clubs across a range of EPPP categories. In doing so, we have advanced understanding by providing rich insights into a range of factors that may facilitate or further hinder FMS and strength development within youth football players. We identified that whilst all participants acknowledged the importance of FMS and strength development for young football players to support their ongoing development and performance, there was variance across EPPP categories relating to: the total amount of time dedicated to developing FMS and strength; number of staff employed to focus on these areas; how qualified and experienced staff are (and how they are utilised); and the integration of the evidence-informed practice into programme design and delivery. Further, although the key foci of academy athletic development programmes largely prioritised injury reduction, performance improvement, and building a physical base for future sport-specific development, the methods used to achieve these outcomes varied (e.g., the use of a combination of key movements within integrated functional and multi-sport activities). Finally, participants reported how interpersonal relationships between sport science support and technical coaching staff had a direct impact on the uptake, nature, implementation and success of the FMS and strength programmes.

All participants in the current study detailed how important they believed placing specific emphasis on FMS and strength development from an early age is for performance enhancement, injury reduction, and ongoing physical development. Further, the participants reported how focusing on these attributes explicitly within their clubs had resulted in beneficial outcomes for players (e.g., improved neuromuscular function; technical skill development; player progression through academy phases). These findings support the existing knowledge base concerning the impact of FMS and strength on youth development in sport.[31,32,33]

462 Specifically, Deprez et al.[34] found that the development of FMS benefited football specific
463 aerobic and technical performance as well as being a long-term predictor for explosive power in
464 football players from childhood to young adulthood. Further, Read et al.[35] found that, in elite
465 English football academies, resistance training was considered as the most important training
466 method used to prevent injury. Consequently, it would appear imperative that football
467 academies continue (or start) to emphasise FMS and strength development in their young
468 players if they are to achieve both the athletic and performance development goals associated
469 with elite youth football. In agreement with Faigenbaum et al.[36], we suggest, therefore, that
470 football club academies should adopt a strategy of *deliberate preparation* that includes planned
471 training and qualified instruction focusing explicitly on FMS and strength starting at the
472 Foundation Phase. In this instance, deliberate preparation means that improvement of FMS and
473 strength should be a predefined goal of training that informs the design of sessions. Training
474 activities should be sport-relevant to allow outcomes to be easily transferred to performance, yet
475 practitioners should be aware that a variety of pedagogical strategies can be employed to
476 actualise deliberate preparation.[36] This is particularly necessary if clubs are to elicit the athletic
477 skill competency developments and prevent the accumulation of neuromuscular deficits during
478 the developmental years as reported by many participants in our study.

479 The level of priority afforded to FMS and strength development varied across our
480 participants' respective clubs for a number of reasons. Indeed, the level of buy-in from clubs and
481 technical coaching staff appeared to directly impact a range of logistical (e.g., time afforded to
482 FMS and strength development) and resource (e.g., number of staff) factors that resulted in
483 different approaches being adopted across academies ranked in different EPPP categories. For
484 example, the amount of time made available to undertake specific FMS and strength
485 development sessions, which varied considerably across different EPPP categories, was reported
486 as a significant logistical factor. Researchers have previously acknowledged that EPPP
487 guidelines have resulted in academies placing greater emphasis on early specialisation with

players subsequently spending more time training at their respective clubs (e.g., Read et al.[13]). Although a number of authors have argued that such an approach can lead to a blunted movement portfolio, increased risk of injury, burnout, isolation and psychological stress [31,37], the increased time in club academies affords greater opportunity to focus on FMS and strength development. However, many of the participants in the current study reported limited time being made available to them for such pursuits (particulartly for Category 3 academies, see Table 2), and nearly all participants stated they would like more time to develop FMS and strength as they believed such emphasis could lead to even greater player development. To address this, the EPPP may need to provide differentiated education and support to academies based on their categorisation relating to working within such constraints. This may mean that EPPP guidelines should be modified to explicitly state that strength and FMS development should be part of the contact hours within the academy system. This would help to ensure a wider focus on these attributes and thus make the development of better athletes and the transferable skills that are beneficial for lifelong sport participation and long-term health more consistent.

One potential reason that the inclusion of FMS and strength training may not have featured as a priority within some of the participants' respective academies is that there is limited longitudinal evidence to support the concept that emphasising FMS and strength development over the technical and/or tactical aspects of the game would have a greater impact on player development and performance.[38] Certainly, as a sport, football is rooted within its coaching traditions, resulting in many being sceptical about new ideas without substantive argument to justify change.[39] In spite of this, participants in our study detailed how key stakeholders (e.g., Head of Academy) at their academies had started to acknowledge the beneficial outcomes of FMS and strength development for young players, and thus reported increasing levels of buy-in. This may be indicative of the commitment some participants reported that their academies had made to employing staff to facilitate FMS and strength training into academy training structures. Nevertheless, we identified a clear disparity between

514 clubs ranked in different EPPP categories with regards to the number and quality of staff
515 employed in their support teams (e.g., sport scientists, strength and conditioning coaches),
516 which had a direct impact on the nature of provision in this area. Indeed, participants who
517 worked in academies with more staff generally reported having a greater frequency of sessions,
518 as well as more time to provide players with individualised feedback (due to a lower coach:
519 player ratio). In accord with Gallahue and Ozman[40], who stated that FMS proficiency is more
520 likely to be achieved with appropriate reinforcement, feedback, encouragement and instruction,
521 it appears that those academies dedicating more time and explicit focus on FMS and strength
522 development by appropriately staffing programmes are able to monitor improvements more and
523 therefore have a more profound impact on player development.

524 Participants in our study also reported the importance of support staff not only being able
525 to deliver and adapt sessions to meet the needs of the players and achieve the desired outcomes,
526 but also a range of interpersonal skills (e.g., ability to build relationships; communication;
527 managing micro-politics) in order to be effective in their roles. Further, many participants in our
528 study highlighted the importance of support staff having a thorough contextual knowledge of the
529 sport (football), and the benefits gleaned from support staff also being qualified as football
530 coaches. It was thought that such qualifications helped support staff to understand how to
531 effectively integrate FMS and strength development into football-specific sessions.
532 Consequently, this helped to improve the relationships and perceptions of respect between
533 support staff and technical coaches, which is considered as vital for facilitating coach buy-in to
534 different approaches to player development.[41,42] Researchers have recently highlighted the
535 importance of support staff exhibiting the personal characteristics that support transactional
536 behaviours during instruction,[42] as well as being able to seamlessly blend scientific, personal
537 and contextual knowledge with practical skills to form a way of *knowing in action*.[43] Such
538 knowledge and skills not only allow an individual to navigate the micro-politics that may inhibit
539 their ability to autonomously develop and lead FMS and strength training programmes, but also

support athletes to develop the self-regulatory skills necessary for them to take ownership of their ongoing development.[44]

In support of this, the participants in our study suggested that being able to demonstrate the ability to *fit* within the academy context (e.g., through appropriate knowledge and skills) helped them to establish themselves as important members of staff within their respective academies, which has subsequently allowed them a little more space, time and access to implement better programmes and ensured they are fully integrated into the wider player development programme and not seen as a separate entity. It is recommended, therefore, that support staff consider the array of knowledge, skills and experience required to be able to operate effectively in the academy environment and, thus, be able to influence the integration of FMS and strength training into common academy practice. Indeed, participants in our study acknowledged that their role and its importance within the academy coaching team structure is becoming more accepted as stakeholders observe first-hand the impact that their FMS and strength programmes are having on player development.

Perhaps as a result of a number of the factors already discussed, the methods participants reported to incorporate FMS and strength training varied but were mainly delivered through functional activities within football-specific, integrated sessions (e.g., fun games, competitive games, drill-based), with only a few participants reporting the additional use of stand-alone sessions that focused explicitly on FMS and strength. Further, while multi-sport activities were strongly advocated by nearly all participants as an efficacious approach to develop FMS and strength, only a small number reported engaging players in a range of sports. In order to help fill the movement vocabulary void that has emerged (cf. Wormhoudt et al.[45]), engagement in multi-sport activities outside of football academy structures has been strongly encouraged, as such activities may ensure that young athletes are exposed to, and develop a diverse range of, motor skills rather than learning only a narrow skill set from specialising early in a single sport.[46] In the current study, the dearth of multi-sport engagement was potentially due to time constraints,

leading to technical coaches feeling an inherent need to focus predominantly on football-specific activities, and in doing so, adhere to the clubs' philosophy to make all sessions contextually relevant.[47] In some cases, where the participants in our study reported a lack of specific contact time with players, they indicated that they provided "movement homework" with the aim of further developing players' FMS and strength during their own time. Here, the participants assumed that the more players practice FMS the more efficient these skills and movements become. However, it must be noted that training loads and volumes have to be carefully monitored, with current training time at an all-time high additional homework may be a potential risk factor increasing fatigue or even longer-term burnout.[14] Further, Rogers, Hassmén, Roberts et al.[48] added that compliance rates may be low and there is a potential risk of players not completing the homework as intended, which may reinforce poor mechanics.

Finally, consistent across nearly all of the participants' academies were the key movements used within their respective FMS and strength programmes (see Table 2). Giles[49] classified a number of these as foundation movements and suggested that their competencies are more important than skills training due to their impact on the acquisition of FMS, although this is a contentious view given the equivocal evidence regarding the link between movement screen competence and on-pitch movement competence[46]. What became apparent throughout our study, however, was the emphasis that participants placed on ensuring that their programmes were fully underpinned by evidence informed practice. Williams and Hodges[50] suggested that previously coaching practice was based on tradition, intuition and emulation and that development should remain the domain of the coach rather than be based on empirical evidence. However, for our participants, there appeared to be a clear shift from this "historical" approach. Accordingly, participants emphasised the need to engage in ongoing CPD to maintain effectiveness in their roles and keep evolving the programme to impact player improvements. Such contentions have previously been acknowledged as key to ensuring that physical development programmes remain fit-for-purpose and continue to achieve the personal and

performance benefits associated with improving a young player's FMS and strength.[41] Those responsible for the development and implementation of physical development programmes are encouraged, therefore, to ensure that they are aware of and fully understand the latest evidence relating to FMS and strength training, as well as the pedagogical strategies that can be employed to elicit positive outcomes[18]. In doing so, it is likely that the effectiveness of such programmes can be enhanced, which will not only have beneficial outcomes for athletes, but also further establish the importance of focusing on FMS and strength development within club philosophy.

Limitations, Future Directions and Summary

In consideration of the limitations of the current study and subsequent future directions, we acknowledge that we focused on the practices of professional academies based in the UK. These practices may not be representative of the work being undertaken in other countries to develop FMS and strength in young players. Researchers may wish, therefore, to compare the practices identified in the current study with those adopted in professional football academies in other countries. Similarly, it may be useful to explore the landscape of FMS and strength development in a range of sports in order to better understand what is currently being done to fill the movement vocabulary void in young people, which is currently a worldwide issue.[45] Second, whilst we consider the current study to offer a relatively unique and in-depth insight into the way in which professional football academies are addressing the development of two key components of youth development within the complex structure of academy football, we focused particularly on the Foundation Phase. Researchers are encouraged to explore how the work completed with the youngest players in football academies is progressed to support ongoing player development through adolescence and into physical maturity. Finally, we have taken a cross-sectional view of what practices are currently being implemented and so further understanding is needed regarding the effective integration of FMS and strength into player development programmes. Indeed, developing models of best practice and longitudinal evidence of the benefit of such programmes would help to support the wider integration of FMS and

strength training and thus facilitate improvements in player performance, injury reduction, and ongoing physical development.

The findings of this study contribute to the existing literature that focuses specifically on the way that professional football academies integrate FMS and strength training into their programmes, particularly in the Foundation Phase. We have presented specific evidence that professional football academies are aware of the importance of developing FMS and strength and are actively implementing interventions to try to improve performance and reduce injury, subsequently working towards filling the movement void that has developed (Wormhoudt et al.[45]). It must be noted, however, that due to a range of logistical and resource factors the emphasis placed on FMS and strength development has resulted in a gulf between the associated programmes employed in academies who are ranked in different EPPP categories. In light of this, it appears that academies may need to utilise growing research-based evidence to further drive the acceptance of FMS and strength training to ensure maximum integration of these skills into wider academy programmes.

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749 **Table 1.** Data analysis and methodological rigour
750

Stage	Activity	Responsibility
1	Immersion in the data through reading and re-reading the transcripts to ensure content familiarity.	Authors 1 and 2 (independently)
2a	Deductive framework testing – a section of raw data was coded against the deductive framework (e.g., *frequency*, *duration*, *focus* of FMS and strength sessions).	Authors 1 and 2 (independently)
2b	The authors shared the outcomes of the initial coding conducted during the deductive framework testing, discussing similarities and differences before agreeing on the suitability for raw data to be coded under specific themes.	Authors 1 and 2 (collaboratively)
3	Deductive analysis of entire data set.	Author 1
4	Inductive analysis - initial codes across the complete data set were created based on information relating to the practices of FMS and strength development (e.g., data that was not coded within the deductive framework). These codes were then categorised into relevant themes (e.g., codes relating to the purpose of activities were categorised as: *injury prevention* or *performance enhancement*) allowing the authors to construct meaning of the mechanisms associated with FMS and strength development.	Authors 1 and 2 (independently)
5	Inductive analysis critical discussion - the outcomes of the inductive coding and categorisation were shared between authors 1 and 2. Similarities and differences between codes and categories were discussed before agreeing on the suitability of the final themes based on how representative they were of the data (improving research credibility, see Tracy[27]).	Authors 1 and 2 (collaboratively)
6a	Analytical rigour – a report was produced using vivid examples that linked the dudctively and inductively coded data back to the aims of the study, which was then shared and discussed between the entire research team. During this process, the research team questioned the first (and second) author's construction of knowledge in order to reflect on how the data had been interpreted (cf. Smith & McGannon[30]). Engaging in such a process ensures that each theme can be traced back to the raw data (improving resonance and sincerity, see Tracy[27]).	Entire research team (collaboratively)
6b	Methodological rigour – we aimed to address Ronkainen and Wiltshire's[29] principles to enhance judgmental rationality in the following ways: (1) *empirical adequacy* is achieved through exploring participants' experiences of the interviews, member checking, and methodological detail regarding data collection; (2) *ontological plausibility* is achieved through engagement with the seminal and most recent evidence-base in the area and through the use of a critical friends approach; and (3) *practical utility* is achieved through the presentation of clear practical implications associated with our findings.	Entire research team (collaboratively)

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752

753 **Table 2.** FMS and strength training activities at Foundation Phase across EPPP Categories

#	Training frequency*	Total duration**	Staff leading delivery***	Key movements	Key foci	Session content
Participants working in Category 1 academies						
1	2 x 30	60	S&C	Push, Pull, Jump, Land, Roll, Crawl	Cooperative games, multi-sports, FMS	Fun games, movement, multi-sport
2	3 x 15	45	Technical Coach + S&C	Squat, Lunge, Pull, Hinge, Push, Brace, Land	Agility/invasion, max speed, competent movers	Game context, fun games
3	2 x 15-20; 2 x 30-40	90-120	S&C	Squat, Lunge, Pull, Hinge, Land, Jump, Push, Brace	Movement patterns, game based movements	Competitive
4	2 x 10-15	20-30	S&C + Technical Coach	Jump, Land	Integration of football and movement skills, injury reduction	Evasive games, multi-sports
5	2 x 45	90	S&C	Squat, Lunge, Skip	Movement skills, speed & direction of foot contact	Fun and invasion games, multi-sports
6	2 x 30	60	S&C	Squat, Lunge	Functional strength, body awareness, acc/deceleration, change direction	Fun games, multi-sports
Participants working in Category 2 academies						
1	1 x 60	60	Technical Coach	Squat, Lunge, Hinge, Land	Movement skills, strength, agility, injury reduction, foundations	Movement patterns, games, competitive, multi-sport
2	1 x 15	15	S&C	Squat, Lunge, Pull, Push, Brace, Rotate	Movement skills	Fun games
3	1 x 30; 2 x 15	60	S&C Interns	Squat, Lunge, Pull, Hinge, Push	Movement patterns, foundations	Movement patterns
4	1 x 45	45	S&C Interns	Squat, Lunge, Hinge, Push	Injury reduction, acc/deceleration, agility, strength, power	Fun games, movement patterns
5	2 x 30	60	SES	Squat, Lunge, Pull, Push, Hinge, Brace, Rotate	Foundations, strength, movement skills	Movement patterns, games
Participants working in Category 3 academies						
1	0	0	None			
2	1 x 30	30	S&C + Technical Coach	Squat, Jump	Movement skills, foundations, strength, injury reduction	Functional movement games
3	1 x 30	30	S&C	Squat, Lunge, Jump, Brace	Movement skills, strength	Fun games
4	1 x 20; 1 x 30	50	S&C	Squat, Lunge, Hinge, Push, Pull, Brace, Bridge	Movement skills, foundations	Functional games, fun games
5	1 every 2 weeks x 20	20	S&C	Squat, Lunge, Core	Movement skills, injury prevention, improve performance	Functional games, fun games

754
755 *Frequency refers to activities directly related to FMS and/or strength training and is reported in *sessions per week*
756 *x duration of session in minutes* (e.g., 2 x 30 = 2 sessions of 30 minutes each); **Total Duration refers to the length
757 of time spent on FMS and/or strength training and is reported in *minutes per week*; ***Where two staff are
758 mentioned the first presented represents the session lead.