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# An audit of performance nutrition services in English soccer academies: implications for optimising player development

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## ABSTRACT

To audit the current provision of performance nutrition services provided to male adolescent players within academies from the English soccer leagues. Practitioners from all 89 academies (status categorised as one-four according to the Elite Player Performance Plan, EPPP) completed an online survey to audit: a) job role/professional accreditation status of persons delivering nutrition support, b) activities inherent to service provision, c) topics of education, d) on-site food, fluid and supplement provision and e) nutritional related data collected for objective monitoring. More full-time accredited nutritionists are employed within category one (14/26) versus category two (0/18), three (1/41) and four (0/4). Respondents from category one clubs report more hours of monthly service delivery ( $62 \pm 57$  h) than category two ( $12 \pm 9$  h), three ( $14 \pm 26$  h) and four ( $12 \pm 14$  h), inclusive of one-to-one player support and stakeholder education programmes. Category one practitioners reported a greater prevalence of on-site food, fluid and supplement provision on training and match days. Across all categories, players from the professional development phase receive more frequent support than players from the youth development phase, despite the latter corresponding to the most rapid phase of growth and maturation. We report distinct differences in the extent of service provision provided between categories. Additionally, players from all categories receive nutrition support from non-specialist staff. Data demonstrate that performance nutrition appears an under-resourced component of academy sport science and medicine programmes in England, despite being an integral component of player development.

## ARTICLE HISTORY

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## KEYWORDS

Performance nutritionist; association football; adolescents

## Introduction

The purpose of a soccer academy is to develop players to represent the first team, thereby reducing the financial strain of having to buy players and/or potentially profiting from their sale (Elferink-Gemser et al., 2012). To develop more high-quality home-grown players, the English Premier League (EPL), the Football Association (FA) and representatives from the Football League, developed a strategic plan known as the 'Elite Player Performance Plan' (EPPP) (Premier League 2011). According to the EPPP framework, clubs are audited and categorised from category one (the best) to four, largely dependent on the extent of support they provide to their players, taking into consideration factors such as productivity rates, training facilities, coaching, education, and welfare provisions. However, despite the mandate from the EPPP for interdisciplinary specialists in the sports science and medicine team, the employment of qualified staff with the specific remit of providing nutrition-related services is only required on a part-time basis for category one status. In contrast, lead sport scientists, lead strength and conditioning coaches, and academy psychologists must be employed full time. Although clubs of category one status are required to (at least) employ a nutritionist on a part-time basis (i.e., working <35 hours per week), those in categories 2–4 do not require any formalised nutrition service provision. This is despite the fact that players from all categories are likely to

experience the same energetic requirements to support both developmental (i.e., growth and maturation) and performance-related goals (i.e., fuelling the demands associated with training and match play) (Hannon et al. 2021b).

In relation to training demands, we recently observed that academy soccer players (U12–U23), albeit from a single Premier League club (Hannon et al. 2021a), may experience similar absolute physical loading patterns to that of adult players within English Premier League (EPL) (Anderson et al. 2016; Brownlee et al. 2018; Hannon et al. 2021a). Importantly, these training demands come at a time when players require sufficient energy to synthesize new tissues (Torun 2005) during rapid biological growth and maturation (Malina et al. 2004). For example, we previously observed that the progressive increase in stature, body mass and fat-free mass (FFM) that occurs in academy male players between the ages of 12–16 increases resting metabolic rate (RMR) by  $\sim 400$  kcal.day<sup>-1</sup> (Hannon et al. 2020). Furthermore, in using the doubly labelled water technique (Hannon et al. 2021b), we also reported that individual players across the academy pathway (i.e., from U12 to U18) may present with an absolute total daily energy expenditure (i.e., 3000–5000 kcal.day<sup>-1</sup>) that is comparable to (or exceeds) our previous observations from adult players of the EPL (Anderson et al. 2017). In this way, academy soccer players present with a higher relative daily energy requirement compared to their adult counterparts (i.e., 60–80 kcal.kg<sup>-1</sup>

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FFM versus 40–60 kcal.kg<sup>-1</sup> FFM) (Hannon et al. 2021b). Where players do not consistently meet such daily energy requirements (Briggs et al. 2015; Naughton et al. 2016), they may present with chronically low energy availability (LEA, often defined as <30 kcal.kg FFM<sup>-1</sup>.day<sup>-1</sup>) (Mountjoy et al. 2018), the result of which could lead to negative symptoms associated with relative energy deficiency in sport (RED-S) syndrome. Such symptoms may present as reductions in skeletal bone accrual, increased risk of stress fractures, delayed sexual maturation, impaired growth and maturation of tissues and organs, and suppression of the immune system (Loucks et al. 2011), all of which can be detrimental to long-term player development.

On this basis, there is a definitive need for clubs to educate and support players and key stakeholders (e.g., coaches and parents/guardians) on such fundamental principles of nutrition. However, notwithstanding differing methods of dietary assessment, we have reported distinct differences in daily energy intake in cohorts of adolescent soccer players from two different category one academies (Naughton et al. 2016; Hannon et al. 2021b), a finding that may be due in part to differences in the extent of service provision and education provided between clubs. Potential differences in service provision within and between category status could initially be underpinned by the nature of practitioner employment (i.e., full versus part-time) and accreditation status (i.e., qualified versus non-qualified staff), the result of which can significantly affect the quality and extent of service provided. Although the EPPP has specified that category one clubs should employ a professionally accredited sports nutritionist (or working under a line manager who is), it is not currently known how clubs in England are currently delivering their nutrition programme.

With this in mind, we aimed to audit the performance nutrition services currently provided to male adolescent soccer players within academies from the English leagues. Using a specifically

designed questionnaire, we surveyed all 89 soccer clubs with an academy of category status (during the 2020–2021 season) in accordance with the EPPP framework (Premier League 2011). It is hoped that our data may prompt critical reflection of service delivery in an area of sport science and medicine which is of paramount importance to optimise player health, development, and performance.

## Methods

### Study design

Practitioners working with academy soccer players from the English soccer leagues were invited to participate in this study. Data were collected during the 2020–2021 season, with all 89 clubs with category status (categories 1–4) responding to the survey (Figure 1). A 100% response rate was achieved by contacting clubs and practitioners via email and professional and personal networks. Respondents were categorised into three different roles: 1) Accredited nutritionists (AN), holding either graduate or practitioner status with the UK Sport and Exercise Nutrition Register (SENr) or a relevant governing body (e.g., Association for Nutrition), 2) Sport Science and Medicine Staff (SSM), as comprised of sports scientists, strength and conditioning coaches, physiotherapists and sports therapists, 3) Interns and Volunteers (I/V), inclusive of individuals on internships, work placements or volunteers. Practitioners were provided a short anonymous survey to complete, consisting of 30 multiple choice and free text questions surrounding the nature of the nutrition service provided at the club. Consent was provided via a consent statement upon submission of the survey. Each club was provided a unique code known by the lead researcher only, to identify clubs for relevant feedback (where requested). The study was approved by Liverpool John Moores University Ethics Committee (20/SPS/046, 10/11/20).

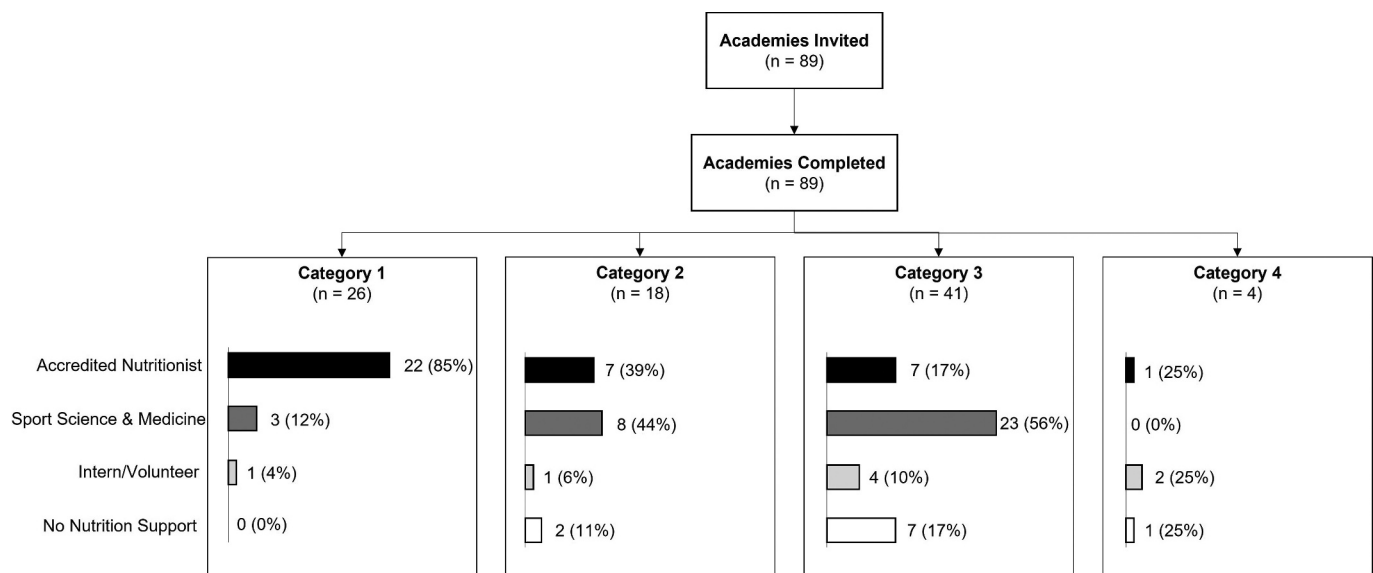


Figure 1. Overview of category status and role of practitioners providing the nutrition support in each respective academy.

**Table 1.** Overview of nature of service provision.

Nature of Service Provision	Examples
One-to-one player support	<ul style="list-style-type: none"> <li>Individualised support to players comprising formal (e.g., planned consultation) and informal (e.g., corridor or canteen conversation).</li> </ul>
Group education	<ul style="list-style-type: none"> <li>Group presentation or workshop delivered to a squad/age-group.</li> </ul>
Parent education	<ul style="list-style-type: none"> <li>Support delivered to parents/guardians of the players, e.g., presentations, practical workshops and newsletters etc.</li> </ul>
Host-family education	<ul style="list-style-type: none"> <li>Support delivered to individuals who provide board and lodging to players, e.g., presentations, practical workshops and newsletters.</li> </ul>
Player cooking workshops	<ul style="list-style-type: none"> <li>Group sessions related to practical cooking and food hygiene skills.</li> </ul>
Staff education	<ul style="list-style-type: none"> <li>Support delivered to club staff, e.g., presentations, practical workshops or individual educational support.</li> </ul>
Catering staff education	<ul style="list-style-type: none"> <li>Support delivered to club catering staff, e.g., group presentations, practical workshops or individual educational support.</li> </ul>

### Survey design

The survey was developed using Online Surveys (formerly Bristol Online Survey, BOS. JISC Ltd) and designed by the research team, all with practical experience of the professional and academy soccer environment (authors DC and MH have provided nutrition support to academy and adult soccer players for 4 and 5 years, respectively, whilst authors GLC and JM have >10 years practitioner experience within professional soccer). The purpose was to establish the scope of current nutrition service provision for elite youth soccer players across different categories of academies in English soccer. The survey was comprised of eight sections: (a) practitioner information (i.e., name, club, category of academy, and job role), (b) professional information (i.e., accreditation status and academic qualifications), (c) nature of service provision (i.e., one-to-one support, group education, parent education, host-family education, cooking workshops, staff education, and catering staff education; see Table 1 for an overview of what constitutes each of these activities), (d) topics of education provided (i.e., basics of macronutrients, basics of micronutrients, eating for growth, fuelling for training, fuelling for games, hydration, recovery, and supplements), (e) extent of on-site food and drink provision (i.e., breakfast, lunch, dinner, snacks, pre-match food, post-match food, fluids), (f) extent of on-site supplement provision and management and (g) objective monitoring of nutritional related data. To compare the differences in nutritional provision between age-groups, the under (U) 9-U11 age-groups were categorised as the Foundation Phase (FP), U12-U16 as the Youth Development Phase (YDP) and U18-U23 as the Professional Development Phase (PDP), all in accordance with the EPPP framework (Premier League 2011). A preliminary focus group was conducted by members of the research team, and nine qualified nutrition practitioners (currently working in both academy and senior professional soccer) before the survey was finalised. This focus group allowed for refinement of wording and focus of questioning to ensure clarity and suitability of questions.

### Data analysis

Descriptive statistics (i.e., mean, SD and frequency analysis) were used to display responses to all questions within the survey, due to the results being comprised of nominal and ordinal data. No data are reported for the FP and YDP in category four, as these phases are not part of clubs in this category.

### Results

A respondent from all 89 soccer academies from the English leagues completed the survey. Respondents were representative of category one (n = 26, 29%), two (n = 18, 20%), three (n = 41, 46%) and four (n = 4, 5%) and included clubs from the Premier League (n = 20, 22%), Championship (n = 22, 25%), League One (n = 24, 27%), League Two (n = 21, 24%) and National League (n = 2, 2%). Quantities and proportions (%) per category of practitioners who delivered the nutritional support are displayed in Figure 1.

### Employment status and hours of support provided

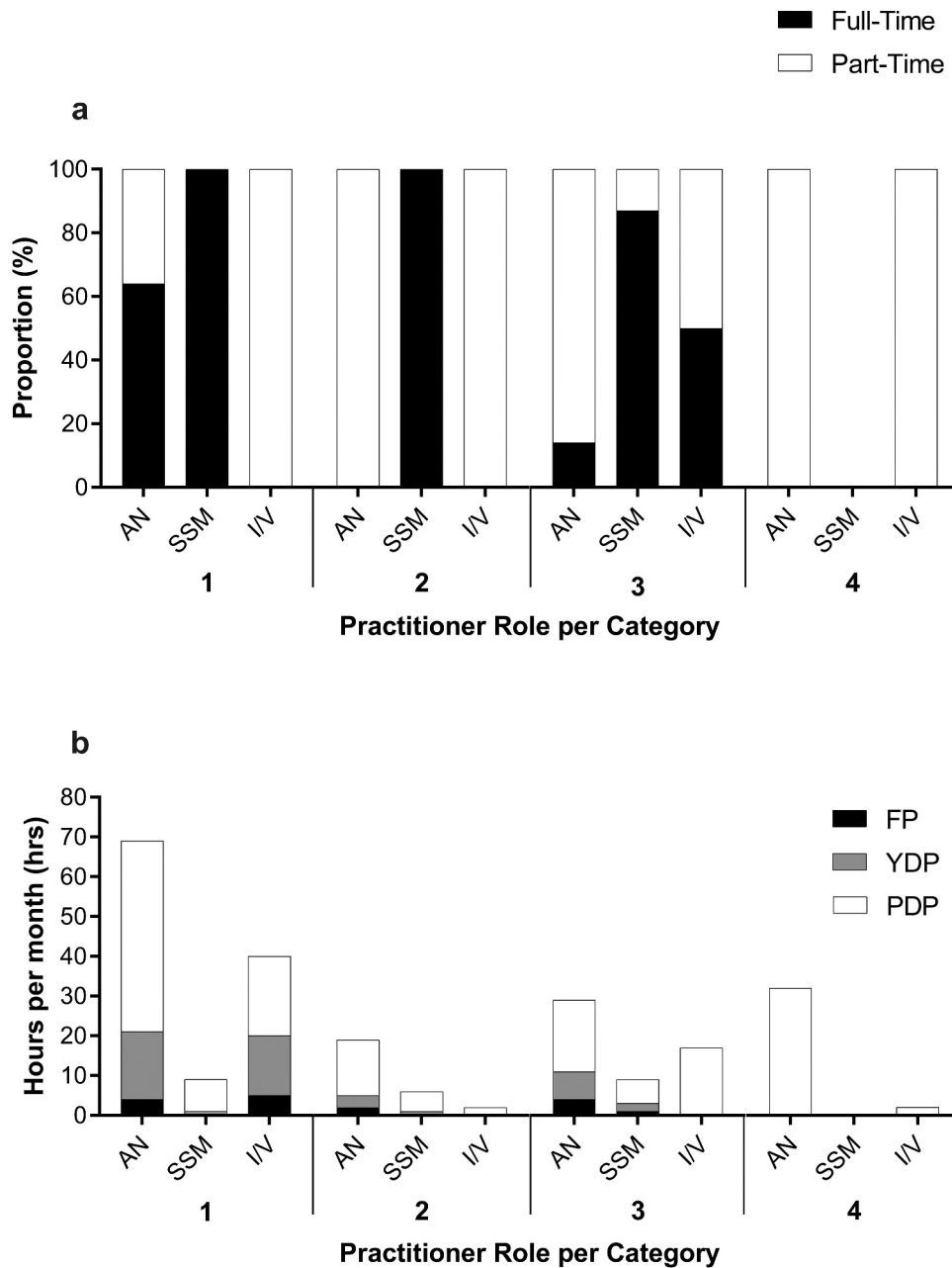
An overview of practitioner employment status and hours of support provided is presented in Figure 2. In category one clubs, 64% of ANs were employed full time, whilst 0%, 14%, and 0% of ANs were employed full time in categories 2–4, respectively. Across all categories, ANs provided more hours of support per month than those SSM staff and I/Vs who were required to provide nutritional support. Additionally, practitioners reported delivering more hours of support per month to players from the PDP when compared to players from the YDP and FP (see Figure 2).

### Nature of service provision

An overview of the varying nature of service provision is presented in Figure 3. The proportion of practitioners providing one-to-one player support, staff education, group education and cooking workshops in category one clubs was greater than that of clubs from categories 2–4. Additionally, a greater proportion of clubs in each category provided these modes of support to the PDP when compared to the YDP and FP. Both parent and host-family education were provided by a greater proportion of practitioners working in category one clubs than categories 2–4. However, a great proportion of category one, two and three clubs delivered parent education to the FP and YDP, whilst the PDP was prioritised for host-family education. When compared to SSM staff and I/Vs, a greater proportion of AN's delivered catering staff education across all categories.

### Topics of education

An overview of topics of education is presented in Figure 4. In category one clubs, a greater proportion of practitioners delivered the topic 'Basics of macronutrients' to the YDP than the FP and PDP. In contrast, a greater proportion of practitioners delivered this topic to the PDP in categories 2 and 3. Similar trends were reported for the



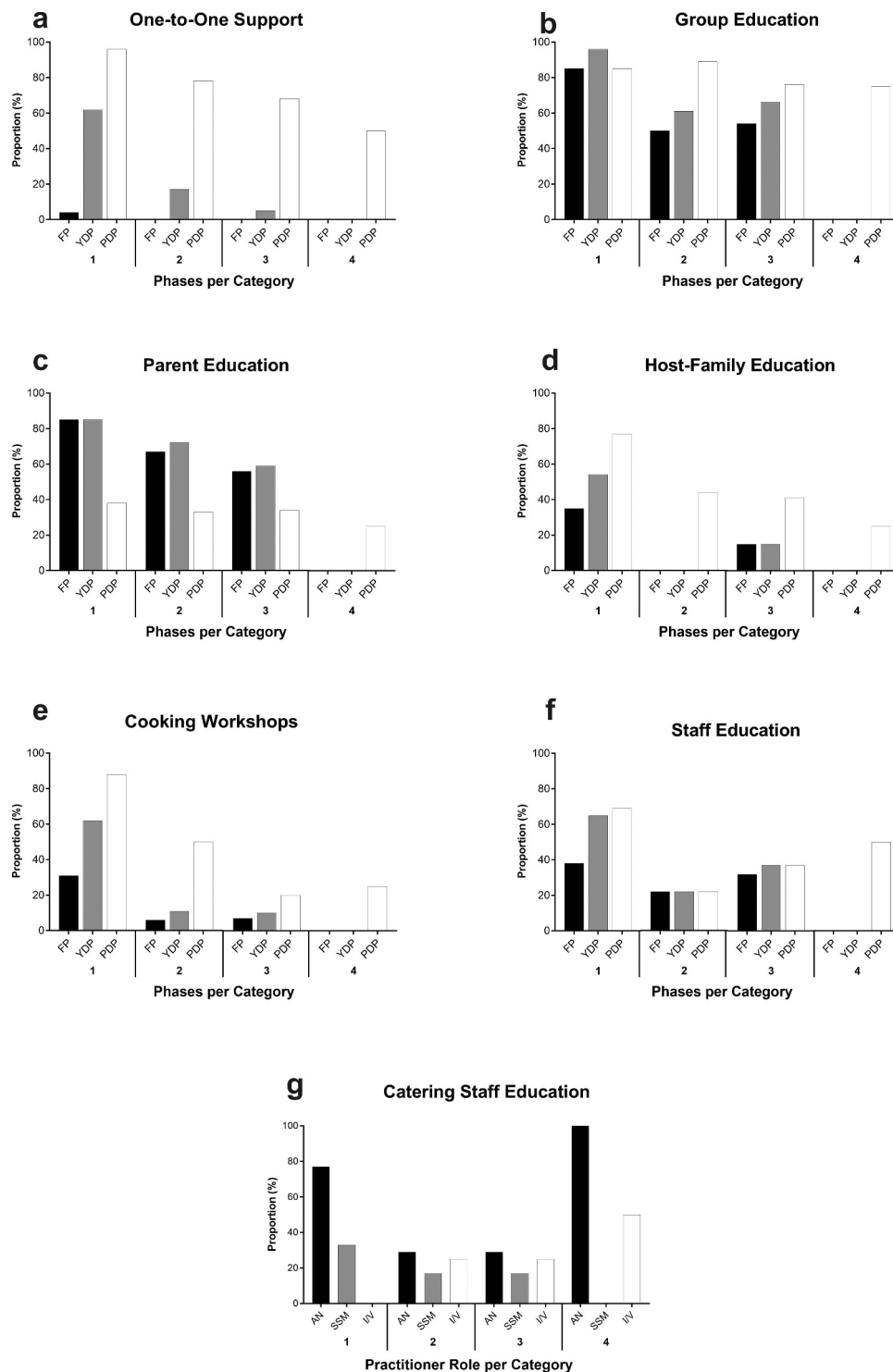
**Figure 2.** Comparison of (a) the employment status of the practitioners who provide the nutritional support at each respective academy, and (b) hours of nutrition provision provided per month to the foundation phase (FP), youth development phase (YDP) & professional development phase (PDP) by either an accredited nutritionist (AN), sport science and medicine staff (SSM), or an intern/volunteer (I/V).

topic 'Basics of micronutrients', as a greater proportion of practitioners delivered this topic to the YDP than the FP and PDP in category one clubs, whilst a larger proportion delivered this topic to the PDP in categories 2 and 3. A greater proportion of practitioners delivered the topic 'Eating for growth' in category one clubs, where a greater proportion of practitioners in categories 1 and 2 delivered this topic to the YDP when compared to the FP and PDP. The topics of 'Fuelling for games', 'Fuelling for training', 'Hydration', 'Recovery', and 'Supplements', were delivered by a larger proportion of practitioners working in category

one clubs than categories 2–4, with a greater proportion of clubs delivering these topics of education to the PDP when compared to the YDP and FP.

### **Food and drink provision**

An overview of on-site food and drink provision is presented in [Figure 5](#). Players in the PDP were provided with breakfast, lunch, dinner, snacks, pre-match food, post-match food and fluids more frequently across all categories

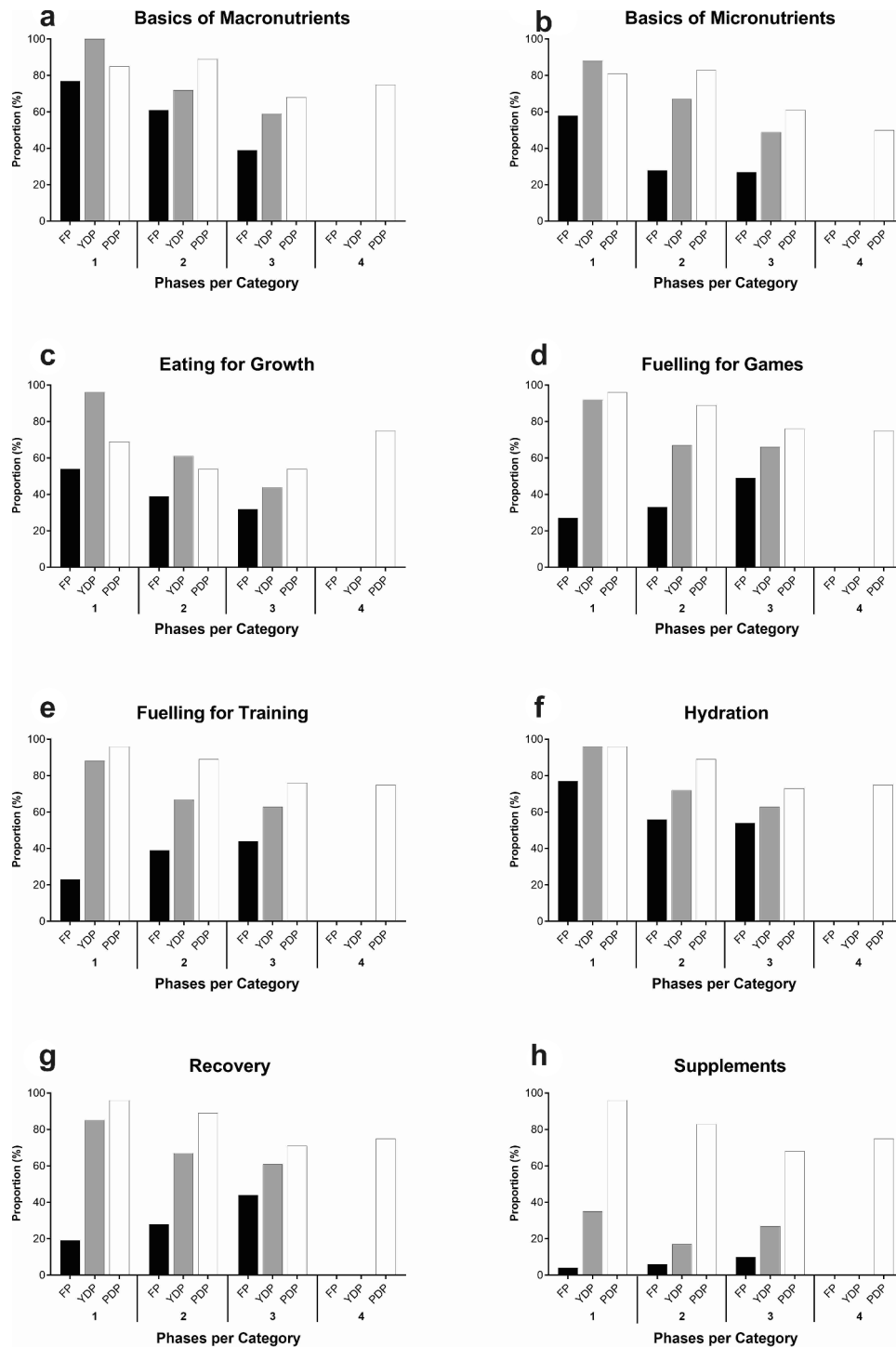


**Figure 3.** Proportion (%) of clubs in each category who provide nutrition provision in the form of (A) one-to-one support, (B) group education, (C) parent education, (D) host-family education, (E) cooking workshops, and (F) staff education to the foundation phase (FP), youth development phase (YDP) and professional development phase (PDP), as well as the proportion (%) of practitioners per role who provide (G) catering staff education.

than players from the YDP who, in turn, were also provided with these more frequently than the FP. Clubs of category one status provided these meals and fluids more frequently to all phases when compared to category two clubs, who also had a greater frequency of food and drink provision than clubs from category three and four.

### Supplement provision

An overview of supplement provision is presented in [Table 2](#). There was a greater supplement provision in category one clubs when compared to all other categories. In all categories, a greater proportion of clubs provided supplements to players in the PDP than the YDP, who were also provided more



**Figure 4.** Proportion (%) of clubs in each category who deliver each theme of education content to the foundation phase (FP), youth development phase (YDP) and professional development phase (PDP).

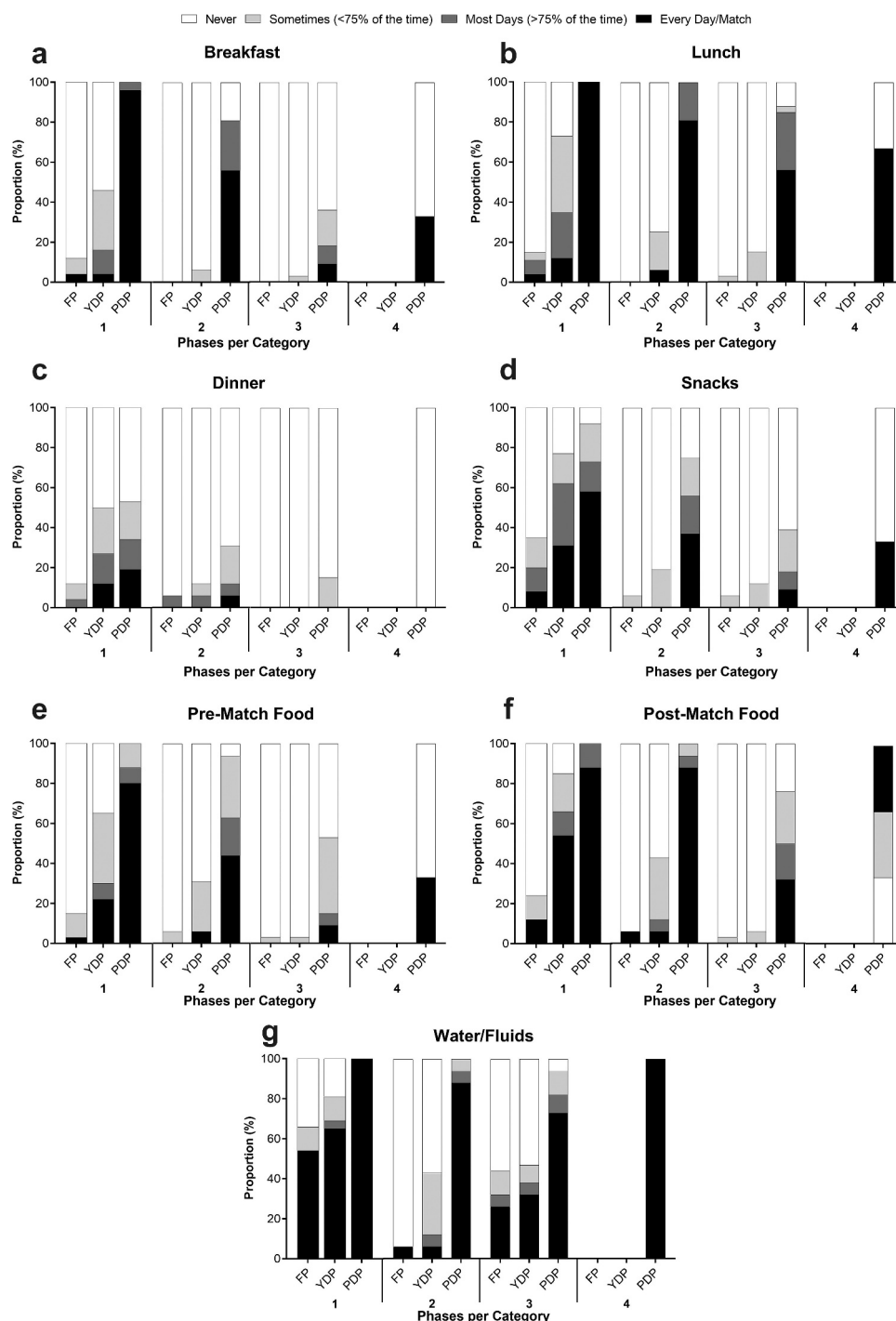
supplements than the FP. The most common supplement provided was carbohydrates (i.e., powder and gels), followed by protein, electrolytes, vitamin D, and caffeine.

### **Objective monitoring of nutritional related data**

An overview of nutritional related monitoring is presented in [Figure 6](#). Category one clubs monitor data related to anthropometric (i.e., stature and body mass) profiling more frequently

across all phases when compared to all other categories, where once every 1–3 months was the most common frequency for this method of monitoring. Across all categories, players within the PDP are monitored more frequently than the YDP, who are also assessed more frequently than the FP. Practitioners from category one clubs also partake in blood profiling more frequently across all phases when compared to the other categories, with once every 6–12 months being the most common frequency. Bloods are monitored more frequently in the PDP when compared to the





**Figure 5.** A comparison between categories 1–4, of the proportion (%) of clubs who provide (A) Breakfast, (B) Lunch, (C) Dinner, (D) Snacks, (E) Pre-match food, (F) Post-match food and (G) water/fluids, and the frequency at which they do so for the Foundation Phase (FP), Youth Development Phase (YDP) and the Professional Development Phase (PDP).

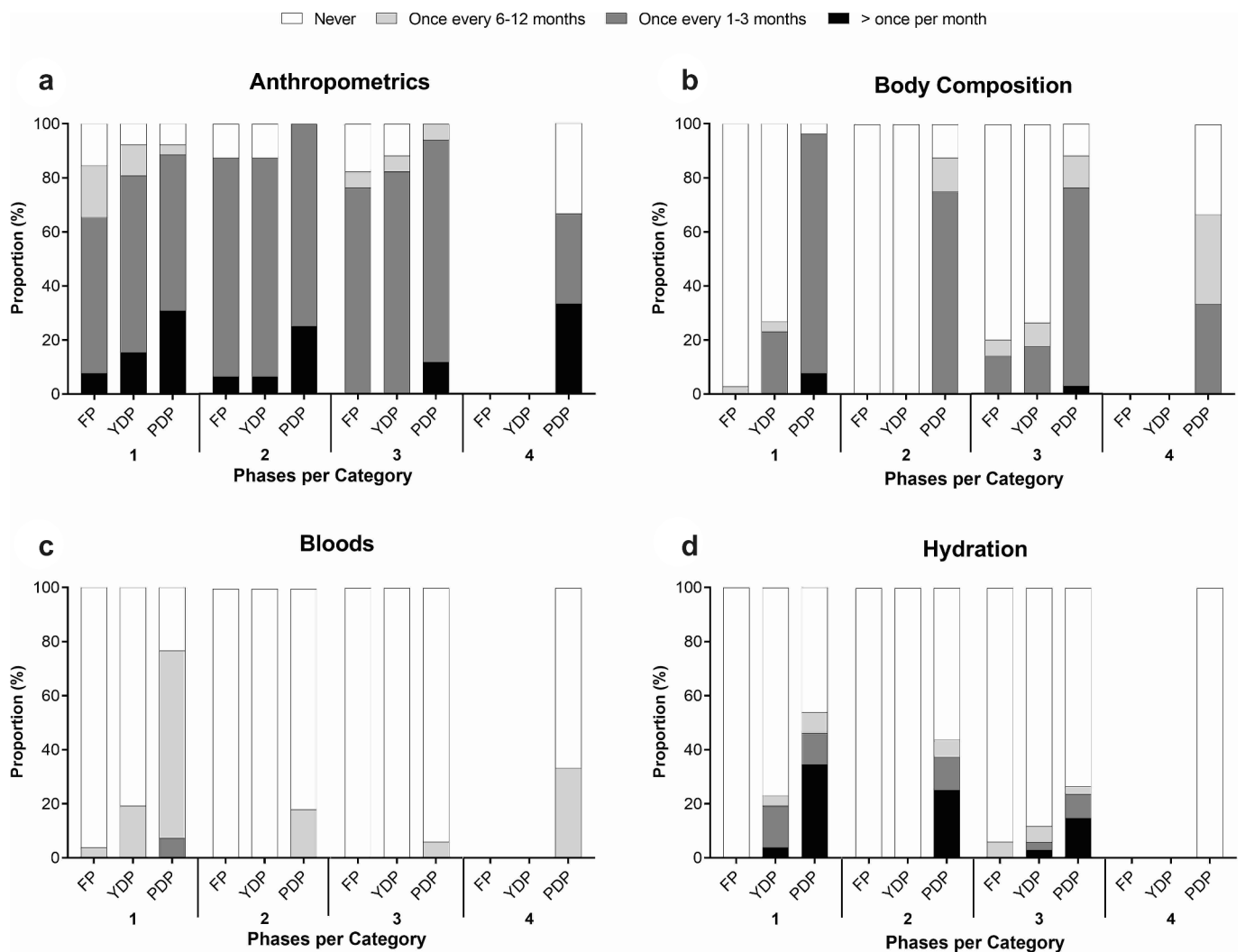
FP and YDP, who are only monitored in category one clubs. Body composition (i.e., skinfolds and/or dual-energy X-ray absorptiometry and DXA) is monitored more frequently in players from the PDP when compared to the FP and YDP across all categories, with once every 1–3 months being the most common frequency. Hydration status is also monitored more frequently in players from the PDP when compared to the FP and YDP across all categories, although it is more common to never monitor hydration status across all phases in each category.

## Discussion

The aim of the present study was to audit the performance nutrition services currently provided to male adolescent soccer players within soccer academies from the English leagues. Using a specifically designed questionnaire, we surveyed all 89 academies with category status (during the 2020–2021 season), as determined in accordance with the EPPP framework. Our data demonstrate distinct differences in the depth of

**Table 2.** Total number and percentage (%) of clubs who provide each form of supplement to the foundation phase (FP), youth development phase (YDP) and professional development phase (PDP) between categories 1–4.

	Category 1			Category 2			Category 3			Category 4		
	FP	YDP	PDP	FP	YDP	PDP	FP	YDP	PDP	FP	YDP	PDP
Carbohydrates	1 (4%)	9 (35%)	25 (96%)	0 (0%)	0 (0%)	14 (88%)	0 (0%)	1 (3%)	16 (47%)	n/a	n/a	1 (33%)
Protein	1 (4%)	4 (14%)	24 (92%)	0 (0%)	1 (6%)	14 (88%)	0 (0%)	2 (6%)	19 (56%)	n/a	n/a	1 (33%)
Electrolytes	1 (4%)	7 (27%)	24 (92%)	0 (0%)	0 (0%)	12 (75%)	1 (3%)	1 (3%)	14 (41%)	n/a	n/a	0 (0%)
Vitamin D	1 (4%)	8 (31%)	21 (81%)	0 (0%)	1 (6%)	7 (44%)	1 (3%)	1 (3%)	19 (56%)	n/a	n/a	1 (33%)
Caffeine	0 (0%)	0 (0%)	19 (73%)	0 (0%)	0 (0%)	7 (44%)	0 (0%)	0 (0%)	4 (12%)	n/a	n/a	0 (0%)
Creatine	0 (0%)	0 (0%)	15 (58%)	0 (0%)	1 (6%)	11 (69%)	0 (0%)	0 (0%)	4 (12%)	n/a	n/a	1 (33%)
Collagen	0 (0%)	2 (8%)	15 (58%)	0 (0%)	0 (0%)	1 (6%)	0 (0%)	0 (0%)	2 (6%)	n/a	n/a	1 (33%)
Multi-Vitamin	0 (0%)	1 (4%)	12 (46%)	0 (0%)	0 (0%)	5 (31%)	1 (3%)	1 (3%)	4 (12%)	n/a	n/a	0 (0%)
Probiotic	0 (0%)	1 (4%)	10 (38%)	0 (0%)	1 (6%)	2 (13%)	1 (3%)	1 (3%)	2 (6%)	n/a	n/a	0 (0%)
Nitrate	0 (0%)	0 (0%)	4 (15%)	0 (0%)	0 (0%)	1 (6%)	0 (0%)	1 (3%)	2 (6%)	n/a	n/a	0 (0%)
Beta-Alanine	0 (0%)	0 (0%)	3 (12%)	0 (0%)	0 (0%)	1 (6%)	0 (0%)	1 (3%)	2 (6%)	n/a	n/a	0 (0%)
Fish Oil	1 (4%)	2 (8%)	2 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	n/a	n/a	0 (0%)

**Figure 6.** A comparison between categories 1–4, of the proportion (%) of clubs who monitor (a) anthropometrics, (b) body composition, (c) bloods and (d) hydration, and the frequency at which they do so for the foundation phase (FP), youth development phase (YDP) and the professional development phase (PDP).

service provision provided across categories, likely underpinned by the greater prevalence of employment of full-time professionally accredited staff within higher category academies. As such, practitioners from category one clubs reported more total hours of service delivery per month, inclusive of both individualised and stakeholder education programmes.

Practitioners also reported providing more specialist support to players from the PDP phase (e.g., one-to-one support, cooking workshops, food and supplement provision) when compared to players from the younger phases. The reduced prevalence of support within the YDP is suggested as an area of improvement, considering that this is the time when players

typically undergo their most rapid phase of growth and maturation. When compared with other sub-disciplines of sport science, our data demonstrate that performance nutrition is an under-resourced component of academy sport science and medicine programmes from English soccer clubs, despite being an integral component of long-term player development.

The greater proportion of accredited nutritionists working at category one academies (i.e., 85%, albeit only 64% are full time) is in accordance with the requirements of the EPPP (Premier League 2011). To obtain category one status, clubs must (at least) employ a part-time nutritionist, with the individual being appropriately accredited (e.g., via a professional body, such as the UK Sport and Exercise Nutrition Register) or work under the direct management and supervision of an individual listed on the register (Premier League 2011). It is noteworthy, however, that 15% of category one ( $n = 3$ ) clubs do not employ an accredited nutritionist to deliver their nutritional programme. On the basis that 64% of the accredited nutritionists working in category one clubs are employed on a full-time basis, it is unsurprising that practitioners reported providing a greater number of total monthly hours service delivery when compared to categories 2–4. Nonetheless, a considerable amount of service delivery across categories 1–3 remains delivered by sports science and medicine staff as well as students on internships and work placements (this was especially prevalent in category three clubs) (see Figures 1 and 2).

In considering the phase of player development, practitioners reported a greater extent and range of services provided to players from the PDP when compared to younger players (see Figure 2b). This was the case for provision of specific activities (i.e., one-to-one player support and cooking workshops) as well as on-site provision of main meals and sports supplements. Additionally, PDP players also receive more targeted education on topics, such as fuelling for match play and training, recovery and sports supplements. The enhanced level of service provision provided to PDP players is, of course, in accordance with the requirement to support players as they potentially transition to first team football. However, the lower prevalence of support provided to YDP players could be a targeted area for specific improvement, especially when considering that this is the time when academy players typically experience their most rapid period of growth and maturation. In accordance, we observed progressive increases in TEE as players progress from the U12/13 age group ( $2859 \pm 265$  kcal·day<sup>-1</sup>, range: 2275–3903 kcal·day<sup>-1</sup>) to U15 ( $3029 \pm 262$  kcal·day<sup>-1</sup>, range: 2738–3726 kcal·day<sup>-1</sup>) and to U18 status ( $3586 \pm 487$  kcal·day<sup>-1</sup>, range: 2542–5172 kcal·day<sup>-1</sup>). Additionally, given that younger players may lead 'busier' lives with schooling activities and lengthy travel to and from training, there is a clear need to provide specific education support on the requirement to fuel correctly before (during school), during and after training (i.e., when travelling home after training). In this regard, it is noteworthy that players from the YDP of category one clubs are reported to receive more education on 'growth and maturation' when compared to the other phases of player

development, as evident both within and between categories. Such data may be underpinned by the increased prevalence of support provided by accredited staff (as alluded to previously), suggesting that qualified and specialist staff may be more aware of how to tailor the necessary education to different phases of development.

In relation to on-site food and fluid provision, practitioners from category one clubs reported a higher prevalence of provision when compared to the remaining categories. Additionally, players within the PDP also receive a greater frequency of food provision across all mealtimes when compared to the YDP and FP. Although we acknowledge that the pattern of meal provision is, of course, likely influenced by training schedule (i.e., players from differing phases of development and category status likely train at different times of the day), the enhanced provision at category one level is most likely related to the significantly greater budgets that are available to practitioners working within those environments (unfortunately, disclosure of annual nutrition budgets was not collected within this study). Indeed, this is supported by the observation that distinct differences in food provision are still apparent on match day, as evident for food provided before and after games. In such scenarios, the need to sufficiently educate key stakeholders (e.g., parents) on practical food strategies at home, such as cooking, shopping and batch cooking skills, to promote both fuelling and recovery becomes readily apparent.

In a similar manner to food provision, practitioners reported a greater prevalence of supplement provision to players from the PDP, a finding that was evident across all categories. Across all categories, the four most common supplements provided included carbohydrate and protein-based products, electrolytes and vitamin D. Such data demonstrate a provision of 'evidence based supplements' in accordance with fundamental principles of nutrition such as fuelling, recovery and hydration. Interestingly, vitamin D was the fourth most prevalent supplement provided. Although this has sound rationale (i.e., given its role in bone development and the lack of sunlight exposure in the UK), we did not collect any information of the typical dose provided. As expected, more 'specialist' and ergogenic-related based supplements (i.e., caffeine, creatine, nitrate, and betalanine) were apparently reserved for players from the PDP of category one and two clubs, perhaps a reflection of the knowledge base of the qualified and accredited staffing base working at this level as well as the actual stage of player development.

In accordance with the requirement to monitor growth and maturation status (Towlson et al. 2021), the most prevalent form of data collection that could be perceived as 'nutrition related' was assessment of parameters for anthropometric profile. The most prevalent frequency of assessment was once every 3 months, a pattern that was largely similar across all categories and phases of player development (see Figure 6a). In contrast, practitioners reported that the assessment of body composition was most frequently performed on players from the PDP (see Figure 6b), whereas younger players were rarely assessed for body composition. Although the assessment of fat mass has obvious ethical issues, it could be suggested that a more frequent assessment of fat-free mass may permit the development of more individualised athletic development and nutrition programmes (Hannon et al. 2020), assuming that such

data collection is positioned and communicated correctly to players and stakeholders. Although sufficient hydration before, during and after exercise is an essential component of performance nutrition (Maughan and Shirreffs 2010), practitioners reported limited objective assessment of hydration status (see Figure 6d). Whilst the decision to engage with such data collection may be based on staff resourcing and cost-benefit analysis, it could be suggested that a more frequent assessment of hydration status could assist with promoting optimal drinking behaviours. As expected, there was a low prevalence of assessment for clinical blood profiles, perhaps due to the ethics issues with blood collection in an adolescent population.

From a practical perspective, our data suggest that the employment of a full-time accredited nutritionist may help to promote long-term player development, as based on the premise that practitioners from category one clubs reported a greater extent of service provision to players and stakeholders. These findings may also allow practitioners working in academy soccer to highlight areas in which their provision is currently lacking and thereby enhance their future delivery. Nonetheless, we acknowledge that we did not undertake any formal assessment of the efficacy of the current models of service provision in terms of both player and stakeholder knowledge as well as the quality of the practical nutrition services that are being delivered to players. Indeed, as with all survey reports, our data is based on self-reported responses, with the potential for response bias where the respondents may attempt to 'look good' with their responses (Rosenman et al. 2011). As such, future research would benefit from detailed qualitative inquiry so as to better understand the individual and organisational factors (e.g., philosophy, staffing resources, logistical issues and budget constraints) that likely determine the nature of the performance services described here. It is also important to acknowledge that the present data are only inclusive of English soccer clubs and hence the present data may not be comparable to soccer academies from other countries.

In summary, we provide the first report to audit the performance nutrition services currently provided to male adolescent soccer players within soccer academies from the English leagues. Importantly, we observed distinct differences in the depth of service provision provided across categories, as evidenced by total hours of service delivery, one-to-one player support, stakeholder education programmes and provision of foods and supplements. Such findings are likely underpinned by the greater prevalence of employment of full-time professionally accredited staff within higher category academies as well as the higher budgets that are typically available within these environments. Additionally, although we observed a more detailed service provision to players of the PDP, our data suggest that players from the YDP would likely benefit from greater support considering that this is the time when players typically undergo their most rapid phase of growth and maturation. Future studies are now required to evaluate the efficacy and effectiveness of the current level of service delivery across all category status as well as qualitatively explore the factors underpinning the current level of service

delivery. Such research could also lead to the co-creation of 'best-practice' service models and organisational, player and stakeholder behaviour change strategies that strive to create a positive nutrition environment that supports player development.

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