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# Danish association football coaches' perception of performance analysis

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## ABSTRACT

Performance analysis (PA) has become a key requirement for association football coaches within England to aid their practice but less is known in other countries. We examined the perceptions of Danish association football coaches towards the use and engagement with PA. An online survey with 34 open-ended and close-ended questions was completed by 200 UEFA A and Pro Licenced coaches, gaining insights into how the coaches' engaged with PA, how PA supported their practice and the future of PA in Denmark. Additionally, five male coaches completed a semi-structured interview. UEFA Pro Licenced coaches had greater experience with analysis support and perceived the importance of video for opposition and reviewing their own team's performance with higher regard than UEFA A Licenced coaches. Cost and time were highlighted as barriers, but a clear desire to have a dedicated performance analyst was acknowledged by all coaches. The research findings provide key considerations regarding the knowledge and understanding of how Danish football coaches review and evaluate performances, highlight the perceived benefits of PA and acknowledge a desire to increase investment. The insights can be used to inform future decision making regarding the direction of PA provision and the education and development of Danish coaches.

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## KEYWORDS

Denmark; video analysis; coach education; reflection; evaluation

## 1. Introduction

Performance analysis (PA) has been defined as an opportunity to objectively interpret performances within complex sport environments (Fernandez-Echeverria et al., 2017) to improve the performance of individual athletes and team behaviour through the delivery of meaningful and purposeful feedback (Bampouras et al., 2012; Nicholls et al., 2018). With previous research highlighting issues with the recollection and recall of previous events by coaches (Franks & Miller, 1986, 1991; Laird & Waters, 2008), there has been a significant increase in the use of PA as well as performance software solutions (e.g. SportsCode, Angles, Focus, MatchTracker etc), which assist the coaches' ability to recall and interpret performances (Mackenzie & Cushion, 2013; Wright et al., 2014). The use of PA allows coaches to draw upon this objective data to make informed decisions, overcoming the limitations of observation recall (Laird & Waters, 2008). Coaches can,

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therefore, identify, diagnose, and correct technical and/or tactical elements of an individual's or teams' performance through an objective lens (Fernandez-Echeverria et al., 2017). The data and information a performance analyst collects have also been highlighted to extend beyond technical and tactical insights into a range of other disciplines including psychology, physiology, strength and conditioning, medical and performance lifestyle (Wiltshire, 2013). Subsequently, the prevalence and use of PA by association football coaches have increased over the last 20 years to aid the coaching and feedback process (Mackenzie & Cushion, 2013; Raya-Castellano et al., 2020; Reeves & Roberts, 2013; Sarmiento et al., 2012).

Blaze et al. (2004) discovered the most popular method of obtaining objective information regarding performances for association football clubs, and their coaches, was through computerised analysis. Clubs found the information gave accountability through objective observation, allowing staff and athletes to feed information back individually, in units or as a team to identify areas for improvement. Groom and Cushion (2004, 2005) reported the use of PA and the information obtained can: (i) assist coaches in the development of an effective style of play for the team, (ii) enhance their professional development and coaching practice as well as (iii) allowing for an in-depth review of their team's performances. Association football coaches continue to utilise the information obtained to address areas for improvement, but Reeves and Roberts (2013) reported the information is also used to reinforce areas of good practice as well as aiding the development of more reflective team players. Through examining the use of PA from a psychological Middlemas and Harwood (2017, 2020) discovered coaches used PA to improve players' self-confidence and communication, with either coach-guided or unguided PA sessions assisting in aiding their ability to self-reflect. Therefore, supporting our previous knowledge and understanding of how coaches perceive the use of PA. Middlemas and Harwood (2017, 2020) emphasised coaches need to be aware of the asymmetrical power that can develop between coach and athlete when using PA. If coaches acknowledge these psychological factors, the incorporation and use of PA within the coaching process by association football coaches can facilitate the effective delivery of feedback, aiding and enhancing players' game knowledge and decision-making (Raya-Castellano et al., 2020; Wright et al., 2013).

Whilst the benefits and use of PA are widely understood within association football, coaches have highlighted several challenges (Barker-Ruchti et al., 2021; Groom et al., 2011; Middlemas & Harwood, 2017; Wright et al., 2012). One of the most frequent challenges highlighted by coaches is concerning the time to collect and analyse the required information to feedback to players (Barker-Ruchti et al., 2021; Wright et al., 2012). Coaches, from a range of sports including association football, were found to typically complete their own formal analysis of each match (91%) often spending between three to five hours collecting their own information (Wright et al., 2012). As a result, professional football clubs have employed dedicated performance analysts to collect, analyse and interpret previous performances, allowing coaches to spend time reviewing the compiled information instead of collecting information (Stanway & Boardman, 2020).

Whilst the number of roles in professional association football has increased in England, the other challenge highlighted by Wright et al. (2012) was regarding the cost of employing a dedicated individual to analyse performances and the cost of the

technology. In certain situations, this leaves the coach fulfilling the role of an analyst due to budget restraints (Barker-Ruchti et al., 2021). When reviewing Irish coaches from a range of different sports, Martin et al. (2018) found evidence towards a spectrum of coaches' engagement with PA; from no formal analysis to coaches carrying out their own analysis to coaches having access to a performance analyst. The researchers alluded to the fact PA and the employment of a performance analyst are still seen as highly systematic as seen in professional contexts. Those coaches who had access to a specific performance analyst were found to access video more regularly, spent more time reviewing the analysed performances, used the information identified to inform training and match preparations, and often held a higher coaching qualification than those coaches occupying a dual role (coach-as-analyst). These findings align with Barker-Ruchti et al.'s (2021) remarks, regarding the employment of a performance analyst plays a considerable role in the interpretation and communication of PA data and information.

Similarly, Painczyk et al. (2017) discovered provincial rugby coaches in South Africa rarely had access to a performance analyst (20% had regular access to an analyst) and most coaches provided feedback to players based on their subjective recall of the previous performance. Despite not typically having access to a dedicated analyst, most of the rugby union coaches indicated the value PA added to their coaching practice. Whilst these findings highlight the disparity between resources and funding across sports and different countries regarding the use of PA by coaches, a consensus was found regarding coaches' positive engagement with PA and found it a useful tool within their coaching process for the development of athletes (Martin et al., 2018; Reeves & Roberts, 2013).

The recent proliferation of PA across the globe and within association football has highlighted the need for further exploration into how coaches in different countries perceive and utilise PA to aid their coaching practice. Barker-Ruchti et al. (2021) reflected on their own experiences as researchers and practitioners to highlight the challenges and problems of using PA in Swedish association football. Whilst acknowledging the benefits PA can provide coaches, they call for a specific need in developing coach and sport management education to understand how to implement and use PA effectively. Their concluding argument aligns with those of Martin et al. (2018), Painczyk et al. (2017), and Wright (2015), and highlight the need for further understanding as to how PA is used in other countries. Therefore, the purpose of this study is to investigate Danish association football coaches' engagement and perception towards PA. In doing so, we hope to shed light on the current level of engagement and support the future development of PA in Denmark.

## 2. Method

Following ethical clearance from a University's Ethics and Governance Committee (SSES2020LA1), which satisfied the conditions of the Helsinki Declaration, a two-phase data collection approach was employed to explore association football coaches' views and opinions of PA within Denmark. First, an online survey, with open-ended and closed-ended responses, was designed, deployed, and analysed. Second, based on the initial data findings a series of individual semi-structured interviews were completed.

## 2.1. Stage 1: online survey

### 2.1.1. Participants

A total of 210 of a possible 661 Danish football coaches voluntarily completed the online survey. Inclusion criteria for the survey defined participants had to be working within the last 12 months in an elite or competitive football setting in Denmark and hold either a UEFA A or UEFA Pro Licence at the time of completing the survey. In the present study, the survey was not restricted to one response per team per professional club due to the large number of teams within each elite or competitive club (e.g. from the academy through to senior/first team). Coaches were required to be 18 years old or above. To ensure all participant's responses were collected from the target population, the second page of the survey included questions pertaining to the inclusion/exclusion criteria. No information regarding specific age or club was requested, ensuring each participant's response remained anonymous and confidential. Due to not all participants meeting the inclusion criteria, 10 participants responses were removed leaving a sample size of 200 coaches. The total response rate was therefore 30% (Table 1).

### 2.1.2. Survey design

The online survey was devised by a performance analyst (lead author) working in professional Danish Football for the last five years and two PA lecturers with over 25 years of experience in the field. The online survey was developed using previously identified themes from research exploring coach, athlete, and analyst perceptions (Mooney et al., 2016; Bampouras et al., 2012; Booroff et al., 2015; Fernandez-Echeverria et al., 2019; Groom & Cushion, 2005; Groom et al., 2011; Kraak et al., 2018). Following the initial generation of questions by the lead author, the research team reviewed the list of questions, question type, format, and layout to fulfil the criteria of trustworthiness as suggested by Shenton (2004) and Nowell et al. (2017).

The survey contained 34 questions and included a range of open-ended and close-ended questions. The survey began with a range of close-ended questions examining participant demographics and a definition: *Performance analysis is the use of video and data as a support tool to understand own team and individual players' performance as well as opponents*. Several close-ended questions, using a Likert scale (1 = most important/strongest agreement/essential, 5 = least important/strongest disagreement/not at all), and open-ended questions were used to cover four key topics: background, resources, collaboration with/without an analyst and strengths and barriers towards PA. As part of the design process, the questions were originally written in English and then translated into Danish by the lead author. The translated questions were examined by a Danish national to ensure the translation represented the context being explored. The translated questions were then inputted into a semi-structured self-administrated survey hosted by the online survey platform JISC®.

**Table 1.** Response rates of Danish coaches who hold either a UEFA A or UEFA Pro Licence.

Response rates	UEFA A Licence	UEFA Pro Licence	Combined
<b>Potential number of coaches</b>	563	98	661
<b>Respondents</b>	150	50	200
<b>Total response rate</b>	27%	51%	30%

### **2.1.3. Procedure and data analysis**

A link to the online survey was distributed to 661 Danish football coaches with a minimum of UEFA A Licence via email. The accessibility to the coaches was obtained via the Danish Football Union's (DBU) webpage, which contains access to every football coach who has completed coaching qualifications in Denmark and given consent to the accessibility of their details. To increase visibility, permission was given by DBU to include a link to the survey in its official newsletter, which was distributed via email to a range of coaches. The survey was first made available on 14 January 2020 and was open for 13 weeks, with reminders being circulated to the football coaches email address after 4 weeks and 10 weeks.

Before completing the survey, all participants were able to view the participant information sheet on the first page of the survey in Danish and were advised by completing the survey they were giving informed consent. The survey took approximately 15 minutes to complete. The online responses were immediately available to the research team. Participants from the online survey were numbered according to their demographic information throughout, e.g. 'MA-43', which indicates a male holding a UEFA A License who was the 43<sup>rd</sup> individual to complete the survey. Descriptive statistics for the questions were expressed as percentages (Sullivan & Artino, 2014). The association between the different coaching licenses and certain outcome variables were explored using Chi-squared analyses and Phi and Cramer's V test of the strength of association. Kruskal-Wallis tests were used to compare variables where responses used ordinal scales. Post hoc analysis with Wilcoxon signed-rank tests was conducted with a Bonferroni correction applied to explore associations between coaching licence and access to analysis support. All statistical analyses were performed using the software R (R Core Team, 2020), version 3.4.2, with the level of significance set at  $p < 0.05$ . The opened-ended responses were extracted and included in the data analysis procedures for the interview data.

## **2.2. Stage 2: semi-structured interview**

### **2.2.1. Participants**

Following the administration and analysis of the survey, five participants were selected utilising a purposive random sampling technique to complete a semi-structured interview (average age:  $43.00 \pm 9.38$ ). Two participants coached men's senior first-tier (each held a UEFA Pro Licence), two participants coached men's senior second-tier (each held a UEFA A Licence) and the final participant coached men's youth first-tier (held a UEFA Pro Licence). To ensure a holistic, multi-layered account of these experiences of PA, participants were selected in terms of their specific representation of age group, coaching qualification, and club level, thus ensuring a broad representation of the total sample size.

### **2.2.2. Semi-structured interview**

The emerging results from the survey provided direction when constructing the interview guide. The guide consisted of eight questions, and from these further discussions took place using probing questions. This allowed the interviewer to draw out real-life examples that were not possible within the survey. The interview questions were constructed to obtain an understanding of how the coaches' engaged with PA, how PA

supported the coach in the coaching processes, which constraints and barriers they had experienced, and the future provision of PA in Denmark. Discussions were also held between the lead author and the second author to allay concerns over potential personal bias the lead author might have in terms of his own experience working as a performance analyst in this country. A pilot interview was conducted with another analyst in Denmark. No changes were made to the interview guide.

### **2.2.3. Procedure and data analysis**

The lead author conducted all the interviews with the five participants and adopted an “active listener” role. The author listened to the participants’ responses and asked further questions, where appropriate, to tease out further details and gain a deeper understanding. Although each of the participants were guided through the eight identical questions, the order was not necessarily the same based on an individual’s response.

All interviews were conducted on Zoom®, due to the coronavirus pandemic and the necessity to reduce physical face-to-face contact. The use of this online video communication platform as a research medium allowed the lead author to capture important non-verbal cues whilst being in a different physical space to the participant (Hanna, 2012). All questions and responses were communicated in Danish. The interviews were completed between March and April 2020 and ranged from 43 minutes to 70 minutes in duration. The audio recordings were transcribed verbatim in Danish by the lead author, yielding 39 pages of single-spaced text in total. The transcripts were sent to each participant for member checking (Lietz et al., 2006; Nowell et al., 2017), before being translated using Microsoft Word translator into English for the remaining authors.

The translated transcripts and the open-ended survey responses were then subjected to a six-stage inductive thematic analysis process (Braun & Clarke, 2006, 2013). Together, the first two authors familiarised themselves with the data, generated initial codes, centred on the research aims. Subsequently, the initial codes were segmented, categorised, and compared for similarities and differences to establish sub-themes. All research then discussed the data, codes, and sub-themes to group the data into themes and sub-themes. During this process, the emerging themes were constantly modified and redefined until theoretical saturation occurred. Once agreement had been reached, the research team deemed the key themes and themes to represent the main emerging topics that described how the participants’ perceived the use of PA by Danish association football coaches. The methodological processes completed in the designing, collecting and analyses of the data were key in establishing the trustworthiness of the findings (Guba, 1981; Nowell et al., 2017).

## **3. Results, findings and discussion**

### **3.1. Participant demographics**

Of the 200 participants who completed the online survey, 150 participants were coaches who had achieved their UEFA A Licence and 50 participants had also achieved their UEFA Pro Licence. The demographics of the participants can be seen in Table 2. Overall, 68% of the coaches were between 30 and 49 years. There was a significant difference between the age of coaches and their qualification ( $\chi^2_4 = 16.582$ ,  $p = .002$ ; Cramer’s V

**Table 2.** Profile of coaches expressed in terms of the highest UEFA coaching qualification held.

	UEFA A Licence % (n = 150)	UEFA Pro Licence % (n = 50)	Combined % (n = 200)
<b>What is your age?</b>			
20–29 years	11%	0%	9%
30–39 years	42%	22%	37%
40–49 years	27%	44%	31%
50–59 years	16%	26%	19%
60–69 years	4%	8%	5%
<b>How many years of formal coaching experience do you have?</b>			
<4 years	2	4	3
5–9 years	20	14	19
10–14 years	34	12	29
15–19 years	18	18	18
20+ years	26	52	33
<b>What is your role in your current workplace?</b>			
Head Coach (senior)	15	34	20
Assistant Coach (senior)	11	12	12
Goalkeeper Coach (senior)	1	0	1
Head of Department (senior)	3	6	4
Head Coach (youth)	36	20	32
Assistant Coach (youth)	3	2	3
Goalkeeper Coach (youth)	1	0	1
Physical Coach (youth)	1	0	1
Head of Department (youth)	14	8	13
Other	14	18	15
<b>What level are you currently employed at?</b>			
<b>Men's football</b>	<b>67</b>	<b>82</b>	<b>70</b>
First-tier (men's senior)	1	20	6
Second-tier (men's senior)	5	14	8
Third-tier (men's senior)	4	4	4
Fourth tier (men's senior)	5	0	2
National team (men's youth)	0	8	2
First-tier (men's youth)	20	14	19
Second-tier (men's youth)	12	2	9
Coaching abroad (men's)	1	8	3
Other (men's)	19	12	17
<b>Women's football</b>	<b>17</b>	<b>10</b>	<b>16</b>
National team (women's senior)	0	4	1
First-tier (women's senior)	3	4	4
National team (women's youth)	1	2	2
First-tier (women's youth)	5	0	3
Second-tier (women's senior)	2	0	2
Other (women's)	6	0	4
<b>Currently not with a team</b>	<b>16</b>	<b>8</b>	<b>14</b>
Job outside football	9	6	8
Without job	7	2	6

0.288), with the UEFA Pro Licence coaches having a mean age of 46.8 whilst the UEFA A coaches had a mean age of 40.0. The UEFA Pro Licence coaches also had significantly more coaching experience ( $\chi^2_4 = 15.498$ ,  $p = .004$ ; Cramer's V: 0.278) as 52% of those had more than 20 years of experience while the majority of the UEFA A Licence coaches (34%) had between 10 and 14 years of experience. This is a natural consequence of the additional time taken and experience required to complete the Pro licence coaching qualification.



Over 50% of the coaches worked as a head coach, with the majority of the UEFA A Licence coaches (36%) working as a head coach at the youth level, while the UEFA Pro Licence coaches (34%) worked as head coaches at the senior level ( $\chi^2_{10} = 14.288$ ,  $p = .160$ ; Cramer's V: 0.267). The coaches (70%) were mainly involved in men's football, while 16% were involved in women's football, and 14% were currently not involved in a team. Most of the UEFA A Licence coaches (32%) were directly involved in the men's youth first or second tiers whilst UEFA Pro Licenced coaches predominately worked within the men's first-tier (20%). These findings are similar to those of Wright et al. (2012) and Martin et al. (2018) whereby more experienced and qualified coaches worked with more senior teams.

### 3.2. PA Environment and resources

To understand the coaches' opportunities to engage with PA a clarification of their available PA resources was made. Table 3 indicates most of the coaches (81%) had access to the video after each match, while 19% would only occasionally or never have access to the video. Concerning access to video of the opposition, 54% of the coaches regularly received access while 46% would only occasionally or never have that available. The UEFA Pro Licence coaches (88%) had significantly more frequent access to video of opposition while UEFA A Licence coaches (58%) would only occasionally or never have access to video of opposition ( $\chi^2_2 = 5.299$ ,  $p = .071$ ; Cramer's V: 0.163).

Our findings (91%) are similar to those reported by Wright et al. (2013) in which 98% of English association football analysts and coaches typically have access to game footage. However, it is important to note Danish association football coaches have greater

Table 3. Performance analysis resources available to coaches.

	UEFA A Licence % (n = 150)	UEFA Pro Licence % (n = 50)	Combined % (n = 200)
<b>Do you have access to the video after each match?</b>			
Yes	77	92	81
Occasionally	13	4	11
No	9	4	8
<b>Do you have access to the opposition video before each match?</b>			
Yes	42	88	54
Occasionally	25	4	20
No	33	8	26
<b>Do you have access to computerised performance analysis software?</b>			
Yes	58	90	66
Sportscodes	9 <sup>a</sup>	24 <sup>a</sup>	14 <sup>a</sup>
XPS Sideline	54 <sup>a</sup>	69 <sup>a</sup>	59 <sup>a</sup>
Dartfish	2 <sup>a</sup>	7 <sup>a</sup>	4 <sup>a</sup>
Eye4Talent	49 <sup>a</sup>	16 <sup>a</sup>	38 <sup>a</sup>
Other	24 <sup>a</sup>	13 <sup>a</sup>	20 <sup>a</sup>
No	42	10	34
<b>Do you have access to external PA data?</b>			
Yes	46	86	56
Wyscout	94 <sup>a</sup>	91 <sup>a</sup>	93 <sup>a</sup>
ChyronHego/Tracab	4 <sup>a</sup>	23 <sup>a</sup>	12 <sup>a</sup>
OPTA	6 <sup>a</sup>	19 <sup>a</sup>	11 <sup>a</sup>
Other	10 <sup>a</sup>	7 <sup>a</sup>	9 <sup>a</sup>
No	54	14	44

<sup>a</sup>Shown as % of participants answering "yes".

accessibility than coaches in comparable countries such as Ireland and South Africa. When exploring Irish coaches in a range of sports, Martin et al. (2018) found between 37% and 68% of 538 Irish coaches would have access to the video. Whereas Kraak et al. (2018) found 67% of 46 South African rugby coaches had frequent access to the video. The use of video for PA purposes has been acknowledged as a key contributor to player development, match preparation and player reflection (Francis & Jones, 2014; Reeves & Roberts, 2013). Fernandez-Echeverria et al. (2017) found the use of video was an effective method for aiding learning through the transmission of visual feedback. Due to the reported connection between video feedback and learning, this method has been heavily utilised among coaches when providing feedback to players (Mooney et al., 2016; Nicholls et al., 2018). However, the differences in access to footage across sports and nations highlight potential implications for player learning through the lack of access to objective feedback.

PA software has been acknowledged as an important and efficient tool to assist coaches in breaking down full game footage into short meaningful feedback points (Wright et al., 2014). The coaches in our study reported having access to computerised PA software on greater occasions than not using it or only sometimes having access (66%), however, UEFA Pro Licence coaches used software 90% of the time whilst UEFA A Licence coaches only used software 42% of the time ( $\chi^2_1 = 15.716$ ,  $p < .001$ ; Cramer's V: .293). A similar pattern was observed by Martin et al. (2018) whereby coaches who had an analyst used computerised software 95% of the time whilst coaches that were also acting as the analyst only used software 40% of the time. Of the coaches that used software in our study, XPS Sideline was the most frequently used software by 59% of the coaches followed by Eye4Talent (38%), SportsCode (14%) and Dartfish (4%). The responses indicate Eye4Talent was more frequently being used by UEFA A Licence coaches, while SportsCode was mainly used by UEFA Pro Licence coaches. When surveying association football performance analysts in England, Wright et al. (2013) found 88% had access to a version of SportsCode and only 10% used Dartfish. This contrasts with the variety of software's used by Irish coaches whereby Dartfish was found to be the most widely utilised software (Martin et al., 2018). This not only highlights the variety of computerised PA software available for coaches but also highlights differences between countries preferences. A contributing factor as to why XPS Sideline is the most frequently used software may be due to the Danish men's national football team using this software (Sideline Sports, 2021). Barker-Ruchti et al. (2021) also perceived with the emergence of several PA companies and the aggressive marketing strategies used, football clubs often feel pressurised to invest in such technology and typically follow what other clubs or teams use.

Our findings draw parallels with Wright et al. (2013) work, whereby 70% of football analysts used external companies to provide individual or team analysis, with teams using Prozone (84%), Amisco (39%) or Opta (32%). Of the Danish coaches, 56% reported having access to external PA data. In a similar pattern to the use of computerised PA by Danish coaches, the UEFA Pro Licence coaches (86%) had significantly greater access to a variety of secondary data sources in comparison to UEFA A Licence coaches (54%) ( $\chi^2_1 = 22.032$ ,  $p < .001$ ; Cramer's V: .344). This observed pattern may be due to the UEFA Pro Licence coaches typically working with senior playing teams whose games are televised and accessible to these secondary data companies. Of the coaches who had

access to secondary data, 93% were being provided with data from Wyscout, while others such as ChyronHego (23%) and OPTA (19%) primarily were provided to the UEFA Pro Licence coaches. Whilst there are similarities between Danish coaches and English football analysts regarding the use of video and data, further explorations are needed to understand how coaches utilise and engage with these tools in the coaching process and how it influenced their planning (Fernandez-Echeverria et al., 2017; Nicholls et al., 2018). It is also important to note a wide variety of PA software and external data companies are now available to coaches and analysts which were not necessarily available at the time of some of the previous works.

### 3.3. The current role of the analyst

With the increased use and access to performance analysis technology, we are seeing a spectrum of coaches' engagement with PA; from no formal PA support to the coach adopting a role as the analyst to coaches that engage with the services of a performance analyst (Martin et al., 2018). Through the coaches which completed our survey, 39% had current or previous experiences working with an analyst (see Table 4). The UEFA Pro Licence coaches (72%) had more experience working with a performance analyst while the majority of the UEFA A Licence coaches (73%) did not have any experience working with an analyst ( $\chi^2 = 29.740$ ,  $p < .001$ ; Cramer's V: .397). Of those coaches that had an analyst to assist their processes, 75% of the coaches indicated the analyst was an essential

**Table 4.** Perceptions of the role of the analyst held by coaches.

	UEFA A Licence %	UEFA Pro Licence %	Combined %
<b>Do you have any experiences working with a performance analyst in a previous or current role?</b>			
	(n = 150)	(n = 50)	(n = 200)
Yes	27	72	39
In current role	34*	56*	44*
In previous role	66*	44*	56*
No	73	28	61
<b>How important is the performance analyst in regard to the quality of your work (response restricted to participants who <u>have</u> experience with an analyst)?</b>			
	(n = 41)	(n = 36)	(n = 77)
Essential	35	50 <sup>M</sup>	42 <sup>M</sup>
Very	38 <sup>M</sup>	28	33
Fairly	15	6	11
Not Very	10	8	9
Not At All	3	8	5
<b>How important is the performance analyst in regard to development/change of playing style/individual performance (response restricted to participants who <u>have</u> experience with an analyst)?</b>			
	(n = 41)	(n = 36)	(n = 77)
Essential	63 <sup>M</sup>	42	53 <sup>M</sup>
Very	28	47 <sup>M</sup>	37
Fairly	8	3	5
Not Very	3	8	5
Not At All	0	0	0
<b>How many hours do you spend on a weekly basis analysing performances (response restricted to participants who <u>do not have</u> experience with an analyst)?</b>			
	(n = 109)	(n = 14)	(n = 123)
<5 hours	66 <sup>M</sup>	43 <sup>M</sup>	63 <sup>M</sup>
6–10 hours	28	29	28
11–15 hours	6	21	7
16+ hours	1	7	2

<sup>M</sup> = The median value for that cohort.

or very important factor for the quality of his work and 90% stated the analyst was an essential or very important support to develop a style of play or change individual performances, regardless of the licence they held.

Those coaches who had the support of a performance analyst highlighted the benefits of having a sole individual to focus on the gathering, interpretation and presentation of the information that was collected:

“[he] gives me time to focus in other areas. It helps the players to have a visual image of their performance and what we demand of them” (MA-39).

“In practical terms, [the analyst] prepares an analysis of the opponent at the start of the week. He then goes through it with [the assistant coach], and then the two present a presentation to me where we have a small meeting, and they say how they think we should approach the game” (Toni)

These findings echo the studies by Martin et al. (2018) and Kraak et al. (2018) as 50% of the coaches found PA essential when developing a style of play. The findings also indicate Danish coaches have considerably fewer analyst-experiences compared to South Africa where 48% of rugby coaches would have continued access to an analyst (Kraak et al., 2018). Indicating differences between countries but also sports, highlighting the need for sporting organisations and clubs to understand the challenges of using performance analysis.

Of the coaches that did not have access to a performance analyst ( $n = 123$ ), 63% indicated they would spend less than 5 hours on PA every week. With coaches reporting that they would largely create video clips and offer feedback “*solely based on my gut feeling and notes from the match*” (MA-32). The presence of an analyst has been found to have a significant impact on the coaches’ engagement with PA, as coaches with analyst-support would receive a higher level of detailed information and are more likely to use PA to inform the content of their training (Martin et al., 2018). Likewise, the findings indicate an environment without analyst-support is not fostering coaches’ engagement with PA as the majority of the coaches are spending less than 5 hours with PA during a week ( $\chi^2_3 = 8.314$ ,  $p = .040$ ; Cramer’s V: .204). Wright et al. (2013) found the majority of analysts would spend more than 6 hours to complete a post-match analysis, which questions the level of detail coaches within this study can apply to their analysis considering the number of hours they engage with PA. However, some coaches such as Michael, one of the interviewed coaches, who did not have the support of an analyst, would spend hours analysing matches in his position as the head coach of a youth first-tier team:

“If there was one person to solely focus on the analysis it would save me so much time. It is one of the tasks that takes most of my time. I would be quite sure that the quality would be higher as well, for sure the individual analysis would. That is usually the part that I have to let go due to lack of time, since it is so difficult to come about every single player.” (Michael)

The statement from Michael relates to the findings by Bampouras et al. (2012), which highlighted a coach’s desire to “*have somebody to come in and just [do] the stats and the interpretation of them rather than [him] watching, coaching and trying to do something*

else”. Coaches are on a tight schedule where everything is measured each weekend. The spectrum of on and off-pitch football tasks potentially takes up a lot of the time, which results in less engagement with PA if there is no support for the coach.

Through shedding further light on the perceptual differences between coaches with or without analyst-experience, we found 62% of the coaches with analyst support stated PA was being used all the time or often in the club (see Table 5). In comparison, coaches without analyst-support reported significantly lower access to PA (38%). A Kruskal-Wallis H test showed there was a statistically significant difference in how often coaches used PA when having access to dedicated personnel ( $\chi^2_3 = 22.8, p < .001$ ). This is in agreement with the findings from Martin et al. (2018) stating 70% of Irish coaches with analyst-support would use PA all the time or often, whereas coaches without analyst-support would use PA less actively. Further analysis of our data also revealed UEFA Pro Licence coaches who had an analyst utilised PA significantly more than coaches with a UEFA A Licence ( $W = 467.5, p = .004$ ) (see Table 5). A similar significant pattern was observed with coaches that did not have an analyst, with UEFA Pro licence coaches utilising PA more than UEFA A Licence coaches ( $W = 436.0, p = .008$ ). These findings make practical sense and align with previous research (Martin et al., 2018; Wright et al., 2012), as having access to a dedicated performance analyst enables coaches to engage with PA to a higher degree and those who hold a higher qualification have had greater education regarding how to use PA.

**Table 5.** Perceptions of frequency of use and the tasks completed or expected to be complete by a performance analyst.

	With analyst-experience			Without analyst-experience		
	UEFA A Licence %	UEFA Pro Licence %	Combined %	UEFA A Licence %	UEFA Pro Licence %	Combined %
Question and response	(n = 41)	(n = 36)	(n = 77)	(n = 109)	(n = 14)	(n = 123)
<b>How often is PA being used in your workplace?</b>						
All the time	23	50	36	13	38	16
Often	28	25	26	21	31	22
Occasionally	25	8	17	32	15	30
Rarely	13	11	12	22	8	21
Never	13	6	9	12	8	12
<b>Which tasks are the performance analyst completing/do you expect the performance analyst to complete?</b>						
Match analysis (video)	71	69	70	71	86	72
Match analysis (report)	46	41	44	60	64	60
Live analysis	24	53	38	52	71	54
Opposition analysis (video)	56	83	69	71	93	73
Opposition analysis (report)	54	64	58	60	86	63
Individual analysis	56	58	57	70	71	70
Training analysis (team)	34	47	40	48	79	51
Training analysis (individual)	27	28	27	49	64	50
Trend analysis (over time)	22	39	30	47	43	46
Video recording of training	34	64	48	47	71	50
Video recording of matches	66	69	68	49	57	50

It is interesting to note the differences in the perceived task (see Tables 5 and 6), with UEFA A Licence coaches largely perceiving these tasks are less frequently completed and less important regardless of having access to analysis. When exploring the importance of tasks, except for “Opposition analysis (video)”, no significant difference in the responses from the coaches were found (see Table 6). This indicated regardless of qualification or access to an analyst, coaches valued the use of video highly as well as the opportunity to conduct analysis that is specific for each individual player. These tasks have previously been identified to be important for the practising analyst in a study by Wright et al. (2013).

Table 6 highlights an interesting trend regarding the importance of “Live analysis” across the participants. Regardless of access to an analyst, UEFA Pro Licence coaches held higher regard for “Live analysis” in comparison to UEFA A Licence coaches. The demographic data showed the UEFA Pro Licence coaches worked predominately in first-team environments where the need for immediate feedback to inform in-game decision

Table 6. Importance of PA tasks perceived by coaches with and without analyst support.

Importance of:	With analyst-support		Without analyst-support		Mean ± SD
	UEFA A Licence (Mean ± SD)	UEFA Pro Licence (Mean ± SD)	UEFA A Licence (Mean ± SD)	UEFA Pro Licence (Mean ± SD)	
<b>Opposition analysis (video)</b>	Very (4.22 ± 1.04)	Essential (4.53 ± 0.81) <sup>a</sup>	Very (3.91 ± 1.23) <sup>a</sup>	Very (4.36 ± 0.75)	Very (4.12 ± 1.17)( $\chi^2_3 = 7.99p = .046$ )
<b>Opposition analysis (report)</b>	Very (3.95 ± 1.30)	Very (3.94 ± 1.07)	Very (3.69 ± 1.16)	Very (3.86 ± 1.10)	Very (3.80 ± 1.17)( $\chi^2_3 = 3.14p = .371$ )
<b>Live analysis</b>	Fairly (3.27 ± 1.38)	Very (3.92 ± 1.02)	Fairly (3.40 ± 1.26)	Very (4.00 ± 0.68)	Fairly (3.51 ± 1.26) $p = .087$
<b>Match analysis (video)</b>	Very (4.49 ± 0.84)	Essential (4.58 ± 0.73)	Very (4.38 ± 0.97)	Very (4.29 ± 1.07)	Very (4.43 ± 0.91)( $\chi^2_3 = 1.46p = .690$ )
<b>Match analysis (report)</b>	Very (4.15 ± 1.06)	Very (4.06 ± 0.92)	Very (4.15 ± 1.04)	Very (3.79 ± 1.05)	Very (4.11 ± 1.02)( $\chi^2_3 = 2.65p = .499$ )
<b>Individual analysis</b>	Very (4.15 ± 0.91)	Very (4.14 ± 0.99)	Very (4.14 ± 0.99)	Very (3.71 ± 1.07)	Very (4.20 ± 0.97)( $\chi^2_3 = 5.74p = .125$ )
<b>Training analysis (team focused)</b>	Fairly (3.46 ± 1.14)	Very (3.97 ± 1.11)	Very (3.69 ± 1.12)	Very (3.57 ± 0.94)	Very (3.69 ± 1.11)( $\chi^2_3 = 4.49p = .213$ )
<b>Training analysis (individual focused)</b>	Very (3.56 ± 1.30)	Very (3.94 ± 1.12)	Very (3.81 ± 1.13)	Very (3.71 ± 0.91)	Very (3.78 ± 1.15)( $\chi^2_3 = 2.06p = .560$ )
<b>Trend analysis (over time)</b>	Fairly (3.41 ± 1.43)	Very (3.83 ± 1.13)	Very (3.95 ± 1.15)	Very (3.57 ± 1.22)	Very (3.75 ± 1.22)( $\chi^2_3 = 5.05p = .168$ )
<b>Video recording of training</b>	Fairly (3.41 ± 1.34)	Very (3.94 ± 1.35)	Very (3.60 ± 1.19)	Very (3.93 ± 0.73)	Very (3.65 ± 1.23)( $\chi^2_3 = 5.47p = .140$ )
<b>Video recording of matches</b>	Very (4.10 ± 1.18)	Very (4.47 ± 0.97)	Very (4.05 ± 1.17)	Very (4.21 ± 1.05)	Very (4.15 ± 1.31)( $\chi^2_3 = 4.48p = .214$ )

<sup>a</sup>= statistical difference ( $p < .05$ ) between UEFA A licenced coach with no PA support and UEFA Pro licenced coach with PA support.

making and affect match outcome is at higher stakes than academy football (Horrocks et al., 2016). One of the interviewed coaches, Scottie, who did not have any analyst-experience, described his ambitions to incorporate live analysis into the structure of his senior first-tier team:

“I wanted to watch the set pieces in the half-time, since it’s often a matter of small details that is deciding the matches. We will not see these details until Monday, when it’s too late. That is something I would really like to have.” (Scottie)

Martin et al. (2018) found between 9% (coach as analyst) and 29% (coach with analyst support) of Irish coaches provided half time feedback with video. In contrast, the Danish association football coaches in our study provided half time feedback with video at a higher occurrence (54% coach as analyst; 38% coach with analyst support). It is interesting to note the coaches as analyst reported higher usage of live analysis than a coach with analyst support (see Tables 5 and 6). Studies have shown immediate feedback is the most optimal method to enhance learning for individuals (Dihoff et al., 2004; Opitz et al., 2011). The current technologies allow coaches to provide close-to-immediate feedback with video at half-time instead of waiting for the match to finish. This method should be acknowledged as a highly efficient way to increase performance levels in a team since the feedback is providing the players with visuals as well as messages (Mooney et al., 2016).

Another potential use of PA, which has increased over the last few years (Lemmink & Frencken, 2013), is within training sessions. Dennis, who is the head coach of a senior first-tier team with analyst-support, described the benefits of being able to review training sessions; “*you know if it went well or not, but it’s always nice to check that in the video afterwards and analyse the flow within the session.*” Steve used to analyse training sessions at his former club and recalled the opportunities it gave him;

“The use of video from training sessions is really valuable. I used that a lot for individual feedback. It was often easier to find the perfect picture in training than in matches. So, I would really like us to record every single session.” (Steve)

The use of PA for training purposes has been found to be an effective method of assessing tactical awareness and technical capabilities (Kraak et al., 2018). However, coaches perceived the recording of training sessions was fairly or very important and between 27% and 50% thought it was important for analysts to conduct training analysis with individual or team focus (see Tables 5 and 6). The results infer a gap currently exists in the knowledge of the effects of PA for training purposes and the perceptions held by Danish coaches as to what the role and benefits of PA are outside of match performances.

### **3.4. Barriers to expanding and progressing the use of PA**

Statistically significant differences were identified between the coaches’ level of licence and the perceived biggest barrier to expanding and progressing the use of PA ( $\chi^2_5 = 12.588$ ,  $p = .028$ ; Cramer’s V: .251). Regardless of the licence, 45% identified costs as the main barrier to expanding and progressing the use of PA. The cost of personnel (87%) was the main response by those coaches (see Table 7). Whilst time was the second biggest barrier by 39% of the coaches, it is important to note that only 11 of the UEFA Pro Licence coaches reported this barrier in comparison to 66 UEFA A

**Table 7.** Perceptions regarding barriers to expanding and progressing the use of PA.

	UEFA A Licence % (n = 150)	UEFA Pro Licence % (n = 50)	Combined % (n = 200)
<b>Barriers</b>			
<b>Cost</b>	<b>43</b>	<b>50</b>	<b>45</b>
Cost of personnel	84	92	87
Cost of software	33	28	31
Cost of hardware	31	28	30
Other	2	0	1
<b>Time</b>	<b>44</b>	<b>22</b>	<b>39</b>
Time taken to complete analysis	76	70	75
Time lost from training sessions	24	10	22
Time to understand and interpret analysis	9	0	8
Other	15	20	16
<b>Knowledge</b>	<b>5</b>	<b>6</b>	<b>5</b>
Lack of knowledge of the effect of PA	57	67	60
Lack of competences	57	33	50
Other	14	0	10
<b>Personnel issues</b>	<b>3</b>	<b>8</b>	<b>4</b>
Constraints from other staff members	75	0	43
Can't find a person to do it	25	67	43
Constraints from players	25	67	43
Other	0	33	14
<b>Value/nature of information</b>	<b>3</b>	<b>4</b>	<b>3</b>
Concern of "overloading" players with data	75	50	66
Concern over reliability of data from third-party companies	25	100	50
Time invested is not worth the value	50	0	33
Other	50	0	33
<b>Other</b>	<b>2</b>	<b>10</b>	<b>4</b>

Note: Participants could only answer one of the main responses. It was possible to select multiple sub-responses. Data for sub-responses are shown as % of participants answering to each main response.

Licence coaches (22% versus 44%). This finding may be related to the fact UEFA Pro Licence coaches are more likely to be in an environment with analyst support. Barriers such as knowledge, personnel issues and the value of information were perceived to be the stand-out barrier by 12% of the coaches.

These barriers were further explained by one of the coaches:

"Analysis is the one thing that costs the most time. Brining in an analyst will save me a lot of time. If there was an analyst who looked at it, you would hope that the quality would be better. I am quite sure that the individual analysis would be better, at least in my case."  
(Michael)

Scottie also alluded to his lack of knowledge regarding PA and how the work that he produced could overload the players with information:

"I guess I miss a feeling of what it's like, as a player, to receive these inputs and how it would affect me . . . My biggest fear is that there will be too many people around the players. We already split up the players, so we don't overload the guys with loads of information and this additional detail might confuse them."  
(Scottie)

The statement by Scottie echoes findings from a recent study by Jones et al. (2020) which investigated barriers to progressing with the use of telestration tools by professional practitioners. Interestingly, 61% of the participants raised concern over information overload and 27% associated players' receptiveness to telestrated clips as a barrier (Jones et al., 2020). However, recent calls have been made by players to have a greater involvement and for them to decide on which information to examine rather than



receiving filtered information (Loo et al., 2020; Middlemas & Harwood, 2017). What this studies finding has underlined is barriers associated with cost and time are significant factors in influencing and informing a coaches engagement in PA (Mooney et al., 2016; Kraak et al., 2018; Martin et al., 2018; Nicholls et al., 2018), but it has also highlighted knowledge is a further barrier for coaches engagement in PA. Club management should recognise PA is a vital tool to assist the learning and development of players (Groom & Cushion, 2005; Perla et al., 2016), and ultimately results, and therefore should consider these findings when balancing the budgets for the team and also the developmental needs of staff regarding PA. It may be a small cost that is necessary to lead to a larger longer-term gain in freeing up the required time for coaches to expand their use of PA and facilitate resources that the coaches are asking for in their hunt for small percentages.

### **3.5. Perceived value of PA to coaches**

Regardless of whether the coach had analysis support or the licence they held, all participants perceived PA was an essential tool for team and individual development and more information through PA was essential for providing quality feedback to the players (see Table 8). These findings align with previous findings regardless of country or coaches experience (Manzanares et al., 2014; Martin et al., 2018; Reeves & Roberts, 2013). The coaches only found the use of PA information about the opposition very important and not an essential part of preparation. Differences in responses could be explained by the coaches' commitment to the club's philosophy and internal development. Coaches in a youth environment tend to focus on individual players development within a philosophy rather than performance mindset typically observed at a senior level (Raya-Castellano et al., 2020; Raya-Castellano & Uriondo, 2015). Senior coaches would be more likely to incorporate the opposition information into the game plan, which could be explained by the fact that the level of detail regarding opposition is increasing with the level of competition (Wright et al., 2013).

When delivering feedback, most coaches felt it was very important for them to lead individual and group feedback sessions. However, it is important to note UEFA Pro Licence coaches with analysis-support only felt it was fairly important for them to lead a session. This finding draws parallels with De Martin Silva and Francis (2020) and Vinson et al. (2017) who found utilising collaborative constructivist learning approaches via PA and using knowledgeable others to aid learning enhanced decision making but also team dynamics. Toni, one of the UEFA Pro Licence coaches provided details on how he ran group feedback sessions:

“We have just a presentation of 8-10 min, which consists of a summary of what we have talked about on Thursday, Friday and Saturday . . . The analyst is the one leading the session as he has all the information. And sometimes I join and sometimes the assistant coach also joins in. Sometimes we have the players up by the board. Sometimes we have group work. Sometimes we just ask questions. And that plan is made before we have the meeting . . . And sometimes the players have also said if they want to be less active. We can run a period where we have had less group work, then we can run a period where there is more group work.”  
(Toni)

Table 8. Profile of coaches perceived value of PA.

	With analyst-support		Without analyst-support		Mean ± SD
	UEFA A Licence (Mean ± SD)	UEFA Pro Licence (Mean ± SD)	UEFA A Licence (Mean ± SD)	UEFA Pro Licence (Mean ± SD)	
<b>PA is an important tool for team and individual development</b>	Essential (4.68 ±0.72)	Essential (4.61 ±0.80)	Essential (4.61 ±0.67)	Essential (4.86 ±0.36)	Essential (4.64 ±0.68)( $\chi^2_2 = 2.59p = .459$ )
<b>PA is just as important as training on the pitch</b>	Fairly (3.29 ±1.10)	Fairly (3.06 ±1.24)	Fairly (3.10 ±1.29)	Fairly (3.21 ±1.48)	Fairly (3.14 ±1.25)( $\chi^2_2 = 0.86p = .834$ )
<b>The more information I have regarding our opposition, the better I can prepare my team for matches</b>	Very (4.22 ±0.88)	Very (4.36 ±0.83)	Very (4.05 ±1.02)	Very (4.43 ±0.51)	Very (4.17 ±0.94)( $\chi^2_2 = 3.52p = .319$ )
<b>The more information I have regarding our opposition, the more I am likely to change my team tactics</b>	Very (4.22 ±0.88)	Very (4.36 ±0.83)	Very (4.05 ±1.02)	Very (4.43 ±0.51)	Very (4.17 ±0.94)( $\chi^2_2 = 3.52p = .319$ )
<b>The more information I have about my own team's performance provides a better opportunity to develop the desired style of play</b>	Fairly (2.80 ±1.17)	Fairly (2.78 ±1.22)	Fairly (2.78 ±1.14)	Fairly (3.21 ±0.89)	Fairly (2.82 ±1.43) $p = .535$
<b>The more information I have regarding my team's performance, the better I can provide quality feedback for the players</b>	Essential (4.85 ±0.42)	Essential (4.78 ±0.49)	Essential (4.78 ±0.52)	Essential (4.71 ±0.61)	Essential (4.79 ±0.50)( $\chi^2_2 = 1.04p = .791$ )
<b>It is important that I lead the feedback sessions to the team</b>	Very (3.80 ±0.90)	Fairly (3.36 ±1.25)	Very (3.64 ±1.02)	Very (3.86 ±0.95)	Very (3.64 ±1.04)( $\chi^2_2 = 2.74p = .434$ )
<b>It is important that I lead the feedback sessions during individual sessions</b>	Very (3.83 ±0.97)	Fairly (3.31 ±1.31)	Very (3.80 ±1.00)	Very (3.57 ±1.16)	Very (3.70 ±1.08) $p = .217$

The extract highlights how the coach utilises a range of individuals, both staff and players, to deliver feedback to the group. The approach outlined aligns with Vygotsky's (1987) approach to learning and provides scaffolding to facilitate learning through context-bound interactions that assist the players in understanding and solving the problems that potentially are going to face or faced during games. Furthermore, through using a variety of delivery styles and acknowledging players feelings and moods, the coach and analyst mediate the learning environment which has been shown to facilitate higher psychological functions (Vinson & Parker, 2019) and high-order thinking and positive interpersonal relationship (Monteiro & Morrison, 2014).

Steve also expressed his thoughts about the importance of coaches' being able to empower his staff members to lead and deliver sessions:

If you want a squad to have respect for an analyst or any other staff member, you need to lead as an example. You have to let the staff be alone with the players. You need to have a behaviour that gives the staff the freedom to do what they do best. (Steve)

Not only does the statement by Steve touch upon the importance of the coach trusting other members of staff to deliver key information but could also align with Vygotsky's (1987) approach to learning. Whereby analysts have typically spent significantly more hours watching and analysing an upcoming team's performance than either the coach or a player. In this situation, the analyst could be viewed as the most knowledgeable individual and therefore scaffold the learning to aid the players' ability to problem solve different sporting scenarios when help is removed during matches. These approaches to learning are becoming more widely used by coaches and are now widely incorporated in coach education programmes (Potrac et al., 2016; Vinson & Parker, 2019), potentially providing evidence as to why UEFA Pro Licence coaches with analysis support deliver feedback differently than other coaches.

### **3.6. Future performance analysis and the analyst**

With the analyst becoming a key member of support staff within Danish Football teams at all levels, the importance of building and maintaining a professional working relationship and environment was highlighted by several of the open answered responses in addition to the interviews conducted with the five coaches. Michael, in particular, described the analyst should be visible and seen as another member of the coaching team:

The more he is a part of the coaching staff the better. It should not be a person who just sits behind a laptop. He should also be there on the pitch for training. He could even be in control of a drill, why not? He should be seen as another coach, but with PA as his key task. (Michael)

For an analyst to understand the coach and the club's thoughts and philosophy, Seth (2019) and Wright et al. (2013) suggested it is important to spend time watching football with the coach. Not only will this provide an understanding of how the coach sees certain things in the game and the analyst can store these thoughts mentally, but it will also enable both individuals to understand the emotions, cognitions, and behaviours of one another (Jowett &

Ntoumanis, 2004). According to Rhind and Jowett (2010), a key component to the maintenance of any relationship is spending time with one another. This time spent together not only maintains the relationship but supports group cohesion (Jowett & Chaundy, 2004).

Furthermore, Martindale and Nash (2013, p. 816) highlighted the importance of the analyst being able to communicate efficiently with the coaching staff since “*while jargon is inevitably going to exist in specific coaching and sport science contexts, academic terminology can be a huge barrier to engagement*”. It was found analysts should apply coaching context to their work to cooperate efficiently with the coach (Martindale & Nash, 2013) and through spending time with each other awareness of working practices will be established. Scottie also mentioned for the players and coaches to utilise the information and develop a professional working relationship, these individuals had to trust the analyst and the work they produced:

There has to be 100% trust in all parameters. If there's any doubt, I would rather have someone who's 5% less qualified. Of course, professionalism is important, but that is the second priority. It takes so much to build trust and very little to tear it apart. (Scottie)

This perception of trust and respect was imperative for the coach to feel they could draw upon the analyst's information and deem them competent (Bateman & Jones, 2019; Jowett & Meek, 2000). These findings draw parallels with the survey completed by participants in Wright et al.'s (2013) work, whereby 90% of coaches felt trust was key between the coach and the analyst. However, Dennis and Steve felt the coach education programmes also affected the acceptance and engagement of PA by coaches and therefore the ability of a coach to trust the analyst. Dennis expressed a dislike towards the employment of analysts in the youth environments:

I believe it's crucial that all our youth coaches learn to use video and to analyse matches. It will be a lot of them who would later be employed as analysts. Persons with a solid coaching background. That is why I don't like the idea of hiring analysts for our academies, since a lot of knowledge will get lost for the coaches. It's important that they get the right education. (Dennis)

Kraak et al. (2018) found most coaches (67%) completed technical analysis themselves, although 48% had access to an analyst. This finding supports the idea of Steve, who thought analysts would be a great support for the youth coaches:

Because there is an analyst, it doesn't mean you shouldn't do analysis yourself. In a lot of the best talent environments, the clubs have a positive talent perspective, meaning that every player should have the chance of improving themselves. A youth coach is not able to reach all players and provide feedback regularly. Also, if you want to be a good coach, you have to be able to work in teams of 6-10 people. (Steve)

The different perceptions held by the coaches highlight the continued confusion of how and why PA should be used and therefore should be taken into consideration by the DBU when conducting education programmes. These should aim to address coaches' ability to interpret and conduct analysis themselves as well as being able to establish and maintain relationships with analysts and delegate PA tasks to other members of the staff, thus expanding the PA provision.

#### 4. Limitations of the study

Whilst the study has provided some novel and interesting findings, it should be noted the participants in the study represent 26% of the Danish UEFA A and Pro Licence coaches. In the way participants were recruited, there may have been a reluctance for coaches with no interest in PA to take part, thus creating a responder bias. However, through the questions asked positive as well as negative perceptions from coaches were collected to present a true picture of Danish coaches' perceptions of PA. Despite this, it could be the case, most of the participants already held positive perceptions towards PA, and therefore would show interest to participate.

Additionally, whilst a range of closed and open-answered questions were used as well as semi-structured interviews, we used three different ranking categories within the survey. Whilst these ranking categories are fairly subjective, the terminology of ranking is fairly common within the demographic being surveyed. While we acknowledge these limitations, we feel these are offset by the sample size and the purpose of the study being to shed light on the current level of engagement and support the future development of PA in Denmark.

#### 5. Conclusion

This study, which was the first to investigate the perceptions of Danish football coaches towards PA, identified coaches perceived PA as an important tool in critical coaching processes such as pre-match analysis, live analysis, post-match analysis and individual development. The findings showed Danish coaches had a well-structured PA environment available for them to engage with PA. Video was provided to the majority of the coaches while PA software and data from external companies were significantly more available for the UEFA Pro Licence coaches. Cost and time were perceived as the two biggest barriers for the coaches to expand their use of PA, which should have implications for club or sports directors to balance budgets accordingly to integrate PA in the coaching processes. The incitement for club or sports directors to integrate PA in the coaching processes is supported by the fact half of the participating coaches found PA to be as important as training sessions on the pitch. The study found the coaches valued PA highly as a tool to develop a style of play and to improve team and individual performances. The use of PA allowed the coaches to be better prepared for matches and be able to provide more qualified feedback to players. The interviewed coaches provided additional insight into the acknowledgement of PA as a part of the coaching process and the role of the modern analyst. The coaches also indicated the importance of integrating the analyst as a part of the coaching staff, thus avoiding a silo mentality. The reluctance of coaches to engage with PA and integrate analysts in the staff was suggested to be due to the lack of acknowledgement of PA as it is the newest role within football.

The research findings identified within this study have implications for coach educators, coaches, performance analysts and sporting directors, and the wider sports performance eco-system. Whilst a clear acknowledgement towards the importance of PA was held, a lack of understanding or clear ideas from the coaches of how to best use PA and the analyst was identified. Thus, further work is needed by coach educators as well as analysts to help educate staff and sporting directors towards the role and expectations an

analyst fulfils. Whilst costs are perceived as the overwhelming barrier to additional PA support, through the increased awareness and education, a shift could occur regarding how directors, coaches and other stakeholders see the potential value of employing a performance analyst to allow detailed information to be collected that coaches could use to aid learning, decision making and ultimately performance. Whilst this research has provided an insight into Danish UEFA A and Pro Licence coaches' perceptions, further investigation into how PA is being utilised by coaches holding different qualifications is warranted, which will contribute to future provision plans of PA.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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