Use and application of wearable technology in football further education settings in the UK

Peter Tierney[a], Neil Clarke[b] and Simon Roberts[a]

[a]Research Institute for Sport and exercise Sciences, Liverpool John Moores University, Liverpool, UK;

[b]Research centre for Life and Sport Science, Birmingham City University, Birmingham, UK

ABSTRACT

The increase in the number of football-specific industry-related qualifications offered by the post-16 education sector has grown exponentially in recent years. Due to technological advancements and access to enhanced equipment, these courses tend to include wearable technology in their curricular to support student cohorts understanding of specific internal and external load patterns. Despite these technological and education developments, there is a dearth of pedagogic research on the application of various wearable technology in post-16 football education. Using a mixed-method research design, we established the type of technology, and how it is being employed across a range of post-16 educational settings. Survey responses suggested that Global Positioning System (GPS) vests and heart rate chest strap were the most prominent wearable technology. Qualitative findings suggested that there are pedagogic challenges and barriers to using this kind of technology, a lack of understanding, and poor feedback and communication strategies. Having established some preliminary findings, a series of 1–1 interviews with identified practitioners working in post-16 educational settings explored these barriers and challenges within contextualised settings in more depth. The results identified disconnect between coaching performance and coaching education, suggesting a lack of knowledge surrounding the uses and capabilities of wearable technology used in football-related FE settings. These findings can help sport, academia and the technology industry to better align and understand in order to meet the educational needs of students seeking to enter a career in sports such as football that use wearable technology.

Introduction

Wearable technology is defined as an electronic device or system incorporated in some part of the body or clothes. These devices (e.g. smartwatches or smart bands) are typically small and include biometric sensors to capture physiological signals, such as heartrate, accelerometer or body tem erature and are configured to track the position of the user wearing it and capture the distance walked or run. For members of the general public, these devices are relatively new; however, performance staff (e.g. sport and exercise scientists, performance analysts and coaches) working in professional football settings have been using this technology for over a decade (Hennessy & Jeffreys, 2018). Due to wearable technological innovations and growth in wearable technology products (e.g. Catapult, Statsports,

Polar), an increasing number of workforce roles has emerged in professional football settings that require a formal education qualification as a minimum operating standard to operate (Buchheit & Carolan, 2019). These technological systems are complex and can generate vast amounts of data. The translation and communication of this data to key stakeholders (i.e. players) are challenging and time-consuming, leading some within the field to question the relevance of the information it provides (Malone et al., 2017; Rago et al., 2019).

Despite these industry-related concerns, wearable technology remains popular, and due to the increased number of associated workforce roles in the football industry, there has been growth in the number of football industry-related qualifications offered by both further education (FE) and higher education institutions (HE) (McFarlane, 2019; Serrano et al., 2019). Saying that, the relationship between the education and professional football sector is not new. For instance, in 1997, a series of initiatives were proposed by the then Department for Edu- cation and Skills (i.e. Playing for Success) to encourage hard-to-reach learners in study support centres located at professional football clubs. For example, study support centres established by English Premier League clubs such as Arsenal FC and Leeds United FC are examples of how the football industry encouraged learners to gain qualifications necessary to progress into a more traditional school or college environment (Sanders et al., 2014). These early franchise arrangements between educational providers and professional football clubs were established to improve the basic life skills of learners rather than provide industry-specific expertise or qualifications. The current professional football and education landscape is however very different. In some instances, FE colleges are partnered with English Football League or Premier League clubs (e.g. Everton Football College).

There has also been an increase in the number of Independent Training Providers (ITP's) owned by former professional players offering bespoke football-related qualifications (e.g. The Robbie Fowler Education and Football Academy). Together, these providers offer learners studying sport-related qualifications, ranging from an NCFE Level 3 Extended Diploma in Sport and Exercise Science to a Level 2 Certificate in Sport (e.g. gym instructor or personal trainer). From a United Kingdom (UK) context, these post-16 providers include words such as 'performance' in the title of the course (e.g. Football Coaching and Performance, Level 3 in Football Performance) and pro- motional information contained on course fact files. Anecdotally, in promotional recruitment, there are claims that the qualification will (emphasis added) *lead to a career working in professional football either as a full-time playing professional or member of support staff*. There is a similar picture in the HE sector, where universities in the UK also provide undergraduate and postgraduate courses in 'football performance', 'performance football coaching', 'football studies' or 'science and football'. In recent years. however, the further and higher education

sector has faced criticism from some within the football industry for not equipping the workforce with the necessary skills, knowledge and understanding to do the job (Buchheit & Carolan, 2019; Drust & Green, 2013; Rago et al., 2019). As growth and demand increase for these workforce roles and coupled with the application of wearable technology in applied football settings, it is apparent that educational providers who offer domain-specific qualifications need to embed the use of technology as part of a mainstream sport and exercise science or sports coaching student experience (Harrison et al., 2022). Currently, there is a dearth of research on the educational application of wearable technology in FE and specifically in sport-related provision offering careers in the football industry. This appears to be an obtuse position considering qualifications such as the suite of Business and Technology Education Council (BTEC) sport science courses, including technology and more specifically wearable technology across core and optional units. There is also limited understanding on the actual use of wearable technology in FE colleges or applications. In addressing this gap in knowledge, the primary aim of this study was to identify the extent of wearable technology use in FE settings and to better understand the perceptions of wearable technology use in an FE context.

Method

Study design and participants

This study adopted an explanatory sequential mixed-method research design, consisting of two dis- tinct phases where more weight was offered to the quantitative phase (Creswell, Klassen, Plano Clark & Smith, 2011). An explanatory mixed-methods approach was considered more suitable than a single-study approach as data from the qualitative, semi-structured interviews helped explain the quantitative results and provided a deeper insight and understanding of the problem under scrutiny (Creswell & Creswell, 2017). A total of 129 respondents comprising FE lectures, professional football academy staff (attached to an FE college) and educators working for ITP's voluntarily completed an online survey. Participants for this study were recruited via various social media posts and promotions by the research team in post-16 education and professional football settings. For example, at the time of participant recruitment, the research team included members employed in each of the industries and so the researcher was able to draw on an established network of FE colleges and other providers that offered bespoke football qualifications within the football and educational sector. Following completion of the online survey, participants were requested to provide contact details and permission to engage in a follow-up interview to discuss the quantitative findings.

Procedure

Survey design and distribution

To ensure suitability, relevance and an acceptable level of rigour, the online survey for this study was developed by the lead researcher, members of the research team and a small group of stakeholders working in post-16 education not involved in this study. Following an iterative process of literature syn- thesis and survey refinement, consensus and content validity on a final 32-item survey was established (Hassan et al., 2006; Hewson, 2017). The final survey questions were integrated onto an institutional Joint Information Systems Committee (JISC) online survey tool and included closed multiple-choice questions (i.e. choose one answer from a list of answers), simple multiple-choice (i.e. choose one answer from a list of two: yes or no), rating scale questions (i.e. Likert 1–5), single textbox (i.e. count data) and ranking questions (i.e. rank a list of options from a numeric dropdown list). The survey also included three open free- text questions. The inclusion of free-text answers provided participants with the opportunity to include more contextual depth and specific examples to compliment the quantitative responses (Wright et al., 2012). This survey provided anonymity for respondents, thus allowing participants freedom to express their views and opinions privately, without duress or other external forces influencing their decision- making process (Bouchard, 2016). We also requested that only one individual from each organisation (i.e. the person responsible for wearable technology) complete the survey, thus minimising potential response biases (Jones et al., 2020). No personal information was collected in the survey. Following full institutional ethical approval and a ten-day pilot period where the online survey was completed by respondents not involved in the study, the survey was distributed using a social media link that contained instructions for survey completion. The survey was open for eight weeks. On the survey landing page, respondents were reminded that their data would be treated with full confidentiality and that they were required to provide fully informed consent. Completion of the study required ~20 min. Participants not meeting the eligibility criteria or agreeing to the consent statement were excluded from the final analysis. At the end of the survey, the participants were asked whether they would agree to participate in follow-up face- to-face online interview with the lead researcher (Table 1).

Table 1. Percentage of Likert survey responses ($n = 129$).

Area of education	Always	Frequently	Occasionally	Never	When relevant (mode of study)
Develop understanding of physical outputs	20%	18%	33%	0.0%	33%
Develop understanding of physical requirements	15%	12%	30%	5%	37%
Inform for a student coach understanding	18%	7%	25%	15%	35%
Develop numeracy skills	3%	15%	27%	42%	12%
Develop IT skills	3%	10%	37%	37%	12%
Other subjects not listed	3%	7%	14%	69%	7%

Quantitative phase analysis

Following the download of the completed survey responses ($n = 129$) and filtering to ensure the eligibility criterion was met, data were subject to basic descriptive statistical analysis. For example, frequency analysis was performed for participant demographics, multiple-choice, ranking and rating scale questions, with the data presented as a percentage of respondent's frequency count. The free- text questions were downloaded onto an electronic notepad application and read and re-read until a

comprehensive understanding of meaning was established.

Semi-structured interviews

A semi-structured interview guide was developed following analysis of responses from the online survey and free-text answers. Thus, questions were more open-ended and allowed the lead researcher to probe participant responses and explore a range of views, attitudes and perceptions. In total 15 participants consented to a follow-up semi-structured interview. The interviews were conducted via an institutional online communication platform (i.e. Microsoft Teams) and recorded for transcription and later analysis. Participants comprised lecturers in FE (*n* = 7), football academy coaching staff (*n* = 4), and independent training providers (ITPS) (*n* = 4), all having a minimum of 4-years experience. The interview structure covered four Sections exploring responses from the questionnaires including:

a) Professional background and educational setting.
b) Use of wearable technology in identified categories.
c) The role of wearable technology in the participants setting in an educational and football- related context.
d) Participant views of barriers, challenges and opportunities of various wearable technologies in educational and football environments.

The verbatim responses, key words and phrases were then subject to a series of first cycle coding. A second cycle of qualitative content analysis was then applied, with key words categorised into units of meaning. Frequencies and percentages are reported in the section below. The triangulation of descriptive, quantitative data and qualitative free-text responses was applied to provide a more comprehensive and detailed analysis of the survey responses.

Results

The survey was completed by 129 respondents responsible for wearable technology use within both formal education (i.e. FE colleges, 72%) and football/education environments (i.e. 28% football academy). Overall, the survey included responses from lecturers in FE (*n* = 86), football academy coaches (*n* = 14) and ITPS (*n* = 29).

Wearable technology type

Figure 1 presents descriptive data regarding the type of wearable technology being used by each organisation. Global positioning system (GPS) vests and heart rate monitoring straps were the most popular type of wearable technology used in each setting. The wearable technology was used primarily for measuring student performance and supporting the training and development of college and academy teams rather than pedagogic/educational purposes. For instance, only

11% of respondents reported using the technology for associated learning and teaching purposes. Across all settings, technology support staff (66%) followed by lecturers (34%) were the people responsible for collecting, storing and managing the data from the wearable technology. The majority (52%) downloaded data for analysis immediately after performing physical activity, and only (7%) performed this during activity. In terms of data download, a docking station (50%), USB connection (25%) and wireless type of connection (25%) were the preferred options.

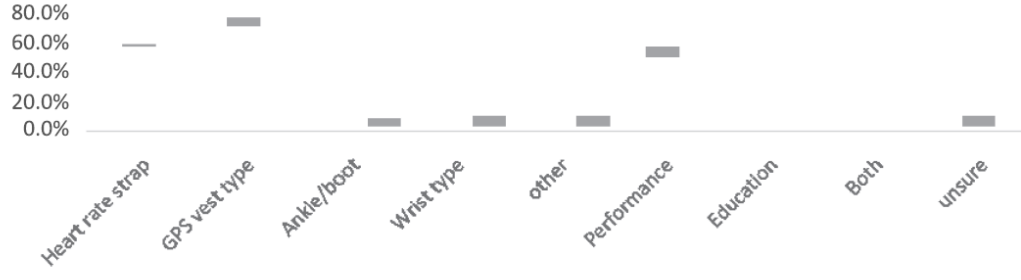

Figure 1. Type of wearable technology being used and primary use.

Nature of feedback

Responses to how technology data was communicated to key stakeholders are presented in Figure 2. In terms of feedback of data, a computer or other type of display screen was most popular with paper form the second most popular method. The majority of respondents provided performance feedback on the same day as data collection (Figure 2). Alongside players and students, feedback was provided to coaches, lecturers, heads of education, heads of performance, sports science and

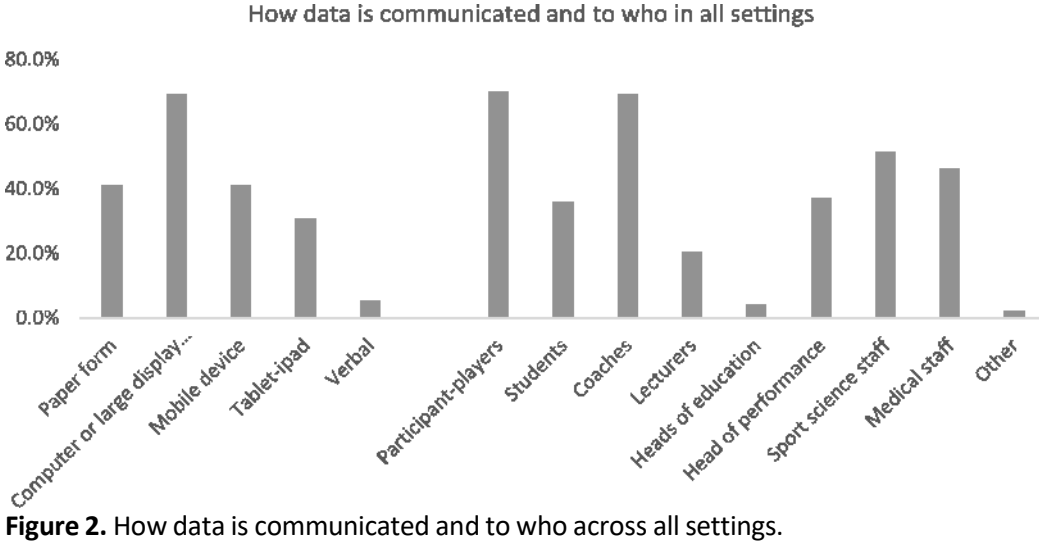

Figure 2. How data is communicated and to who across all settings.

medical staff. This was primarily to feedback on performance, to monitor training load and educational purposes. Feedback data were displayed in player environments such as changing rooms, notice boards or displayed on plasma screens in open access areas.

Results of the types of metrics used for measurements fell into three distinct categories. The most popular being internal training load (e.g. physiological body stress) captured via heart rate type devices. External load (e.g. locomotor and mechanical stress) was derived from GPS-type devices, and tactical aspects were captured from ankle- or boot-type fitted devices. For external loads, total distance followed by maximum speed was the most reported, and for internal load measure, percentage of maximum heart rate was the most popular (Figure 3).

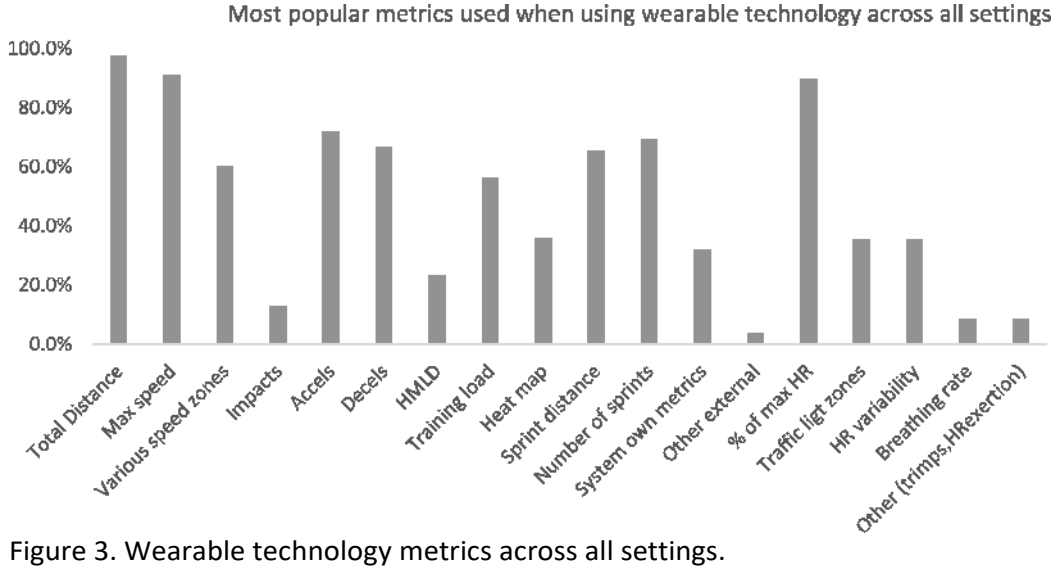

Figure 3. Wearable technology metrics across all settings.

Challenges associated with wearable technology

Reliability and accuracy were the most cited responses to questions surrounding the pedagogic challenges associated with wearable technology. Respondents were largely positive about the pedagogic value of embedding wearable technology into the curriculum, agreeing that it would complement learning in other curriculum areas such as Information Technology (IT) and numeracy. Some of the respondents, however, acknowledged the complexity of the technology and questioned whether a complete understanding of the technology was fully accomplished.

Free-text comments

Participants stated that wearable technology was very useful for supporting the practical coaching elements of BTEC sport qualification, for example: '*Provide useful feedback to coaches and players'*. Several respondents mentioned that wearable

technology was useful for providing football- specific physical performance measures when players were reluctant to accept coach observations, e.g.

> Gives objective data and outputs that are specific' 'Gives an explanation behind performance, for instance if a player not doing as well then can look back at data to inform on fatigue and other factors.

When expanded into other specific subject areas such as learning and teaching, numeracy responses being popular, example responses included:

Can serve as a medium to promote interest in numeracy, which has a tendency to be a very dry subject. By having data from football tends to be better buy in from students' and ' … able to contextualise data as it dis- guises the maths to real life and connects with students.

However, one respondent felt it was not useful commented: '*Numeracy skills have likely already developed by this time'*.

In terms of usefulness for developing language and literacy skills, the picture was more mixed with educators indicating the use of wearable technology was not useful in developing literacy skills. For example: '*Technology does not help them construct sentences.'* It is perhaps not a surprise that enhancing IT skills, all of the respondents stated that wearable technology was very useful*:*

> … besides the obvious in relation to operating software, I think troubleshooting is a key skill often overlooked that this can aid' and 'Can serve as a medium to promote interest in IT to better enhance students buy in to IT.

Educational student experiences

When used primarily for education across all settings enhancing the student learning experience was the primary response, followed by coach education. Use in supporting literacy and language was recorded least important.

Pedagogic barriers, concerns with the use of wearable technology

Qualitative content analysis surrounding barriers, concerns and the use of wearable technology in football-related FE educational settings is illustrated in Tables 2–4. Some responses for barriers and concerns tended to be operational and context specific, a good example being:

> … staff turnover, I suppose, teachers come and go, and there's no momentum to build relationship and start using different innovative approaches, and the way to work is, build relationships with people and then start to collaborate with interesting ideas. So the fundamental core skills, how to deliver the units, understand the systems, that needs to be in place before you start to add all the interesting aspects on top, the more creative side of it.

A number of free-text responses highlighted cost as being one of the barriers to embedding wear- able technology in the taught curriculum. This was also mentioned

by some of the participants during the interviews with one interviewee suggesting that:

> The smallest number we'll ever run anything on, certainly for undergrads, is about 20, 25 students, which is a lot of devices to try and convince somebody in management to buy … .

However, during the interviews, it was apparent cost was not the only barrier or concern, other aspects, such as knowledge, understanding and communication, were captured as more immediate concerns. For instance, one of the participants responded:

> They need to gain knowledge surrounding its use and not just for playing but the many other aspects of uses … ' ' … without communication skills, what is a coach? I mean, if they can't impart that knowledge onto another, they're not coaching. So that's the way I see it, so if we're collecting data, and that data is being used for performance, if you can't communicate that in a positive and productive manner to that player, there's no point collecting it in the first place'.

Some respondents commented on how the technology presented barriers:

> 'If there was less black box thinking, we could compare manufacturers a lot easier about there being that sort of commercially sensitive algorithm or whatever's going on, which then, in terms of looking at the more holistic approach, if you can compare more readily different manufacturers, then we can actually start to get bigger databases and stuff to see'. 'Marketing claims an example being metabolic load that some report yet has nothing to do with metabolism causing misuse of language and thus the student becomes confused and then doesn't learn anything'.

There were also some shared concerns around the reliability and accuracy of the many different types of wearable technology. The following statement was captured in one of the interviews:

> Someone's had an ECG. Here's the Polars trace and here's the Fitbit trace … , the Fitbit might come out with like twenty beats lower or something like that, and again, the same goes with the calorie expenditure side of it as well, which probably has less relevance to sport, but from a recreational purpose, quite a lot of people see exercise purely for the calorie expenditure, and you can sort of see that it might vary by 10, 20%, which obviously has the implications then for people creating calorie deficits and trying to lose weight, or even maintain weight.

This further highlights examples of the confusing and conflicting language and data, from the many different types of wearable technology and what they report on and how this is presented, with one participant commenting:

I probably mentioned it quite a lot of times, the application and understanding of actually the feedback that is being provided is critical.

In terms of development, expanding on the themes in Table 4. Understanding and linking knowledge, interviewees responded;

> … if a student's coming out of FE or university and doesn't know about wearable technology and how to use it, what's it about, then they're already at a disadvantage because we are in a technological world now, this is the age of technology, and if the graduates don't know how to use it, they're already at a disadvantage in the job market …

> I don't think the way that we teach the GPS at the minute is understandable from a coach or sports science perspective, I think I'd like to see it being used more that there's a greater understanding from probably different roles that can interpret the information.

The above point was echoed by several of the participants during the interview. For example:

> … From a pedagogic perspective, the current model appears to be one where students are shown the potential benefits of the system. They are allowed to 'play' with the software in a lesson, logical from a cost perspective, but makes little sense from an experiential learning perspective.

When probed in more detail, we established that what this means for students was a lot of time sitting on benches in sports halls looking at large plasma screens of decontextualised data that had no meaning or relevance. For some FE colleges and ITP's who had paid vast sums of money for expensive wearable technology systems, it also doubled as a potential marketing tool. For instance, some college staff stated that they would often take photographs and then share them on social media and use for either self-promotion or as a marketing strategy to showcase the inno- vative nature of the course. These results provided further evidence that wearable technology, when used, is not being used for its intended. For some of the participants we interviewed it was clear that students did not receive a positive learning experience and as a consequence did not gain a full understanding of the technological possibilities or knowledge to apply in a football performance context.

Table 2. Barriers around wearable technology use in your workplace.

Area	Barriers	
Theme	Quantitative number of responses	Exemplar qualitative comment
Cost	11	• cost of equipment with number of students and continuous upgrades and licencing
Knowledge	4	• Lack of delivery on specific education courses specifically FA
Understanding	4	• being able to get the students to understand the importance of and the meaning of the data Lack of understanding from staff
Accessibility	4	• Restricted use as need a docking station, long turnaround time, unable to access the data or process easily. • GDPR compliance and student consent
Simplifying	3	• overcomplicated tech that is continually changing
General	2	• Lazy practices. • Wearability of equipment

Table 3. What concerns if any do you have surrounding the use of wearable technology in education.

Area	Concerns	
Theme	Quantitative Number of responses	Exemplar Qualitative Comment
Cost	2	• cost vs reward
Knowledge	6	• Too data driven need for an holistic view. • No point collecting and reporting on data if it is not being applied correctly. • Lack of knowledge on how to apply and use the information correctly from the data produced from the technology being used.
Understanding	12	• Reliability and accuracy of the data being produced. • Data being used as a tool to punish.
Accessibility	5	• GDPR compliance and data ownership specifically if being used in sports education
Simplifying	4	• Sports brands/suppliers insisting using their technology and specific unique metrics. • Too many numbers without context
General	1	• Lose sight of the creativity aspect of football in coach education

Table 4. In an ideal world how would you like to see the use of wearable technology develop.

Area	Development	
Theme	Quantitative number of responses	Exemplar qualitative comment
Cost	3	• Cheaper technology for education would make, i.e. easier for institutions to develop their offering to students.
Knowledge	3	• Need to be able to gain applied knowledge as opposed to current theory only approach.
Understanding	7	• Less black box. • More understanding of how can use technology to develop education of students in other related areas such as IT/literacy.
Accessibility	7	• Organically as an extension of the need for first person evidence of skills in vocational areas as part of remote learning. • Using data generated to embed numeracy in teaching and across numerous subjects.
Simplifying	5	• Move from paper forms and spreadsheets to interactive individual mobile type applications. • Simplify the data to something users can understand.
General	6	• Needs to be more individualised and player/student centred. • More consistency and openness from manufacturers.

Discussion

Technology use has become widespread throughout society and its use in sports, specifically football and education has become established. Early studies on use in sports in the education context concluded that it led to authoritarian coaching styles (Blackett, Evans and Piggott, 2019; Williams & Manley, 2016). There are others (Collins, Carson and Cruickshank, 2015) that have shown technology can have a positive effect on the coaching process and result in improved levels of human performance behaviours. Later studies reported on there being conflict and confusion specifically surrounding wearable technology in the sport of football (Malone et al., 2020; Rago et al., 2019), and others warn of the potential pitfalls, such as undermining the deeper, more human aspects of the sport (Cronin et al., 2017). In the context of the

current study, it was established that wearable technology is used extensively within FE settings and the devices used are those typically adopted by the football industry (i.e. GPS vest and heart rate chest straps). However, findings suggest that the technology is being used primarily to support the performance of college teams (Akenhead & Nassis, 2016) rather than for associated learning and teaching, and in some instances, the technology was used for promotional marketing reasons. Interestingly, when asked about the type of wearable technology used for personal use, the vast majority of respondents opted to use wrist-type devices over GPS vest or heart rate chest straps. Whilst understandable that general consumers choose the convenience of wrist-type device; under football regulations, these types are prohibited for use (Nosek et al., 2021). Its inclusion for discussion here is warranted, as wrist-worn technology, and specifically consumer ones are markedly different from those used in sports such as football (Mencarini et al., 2019). Poor accuracy and unreliability in many consumer devices are still commonplace (Haghayegh et al., 2019), contributing to resistance to using wearable technology in an educational context. With numerous responses identified reliability and accuracy as a major challenge being faced with the use of wearable technology. The football industry uses wearable technology far more frequently across all departments than those solely in an education-orientated environment.

Within the educational setting, wearable technology was predominantly used to develop learning and to enhance the overall student experience within specific subjects, and only when relevant to a unit or mode of study. It could be argued that this identifies a lack of engagement with the potential of technology from academia (Attallah & Il-Agure, 2019; Bower & Sturman, 2015) when not in a formal structure (Harper, 2018) or in sport (Luczak et al., 2020), and specifically in the aforementioned professional football academies in the UK (Jones, 2019).

It is well documented that when technology is developed and refined within specific educational programmes, there are positive outcomes in coach education (Cronin et al., 2017), as well as increased teaching and learner engagement (Dray & Howells, 2019; Evmenova et al., 2019; Turick et al., 2021). 'Whilst we are seeing post-humanist views slowly enter the educational research landscape these entrees have predominantly been within the field of literacy studies' (Peppler et al., 2020). Previously described, educational environments appear to use wearable technology similar to how it is used in football (i.e. performance). Reasons for these findings could include a lack of understanding of the capabilities of wearable technology (Crook & Gu, 2019; Goad et al., 2019), lack of supportive evidence in coach education (Cushion & Townsend, 2019), resistance to change (Albion et al., 2015), misuse and apathy (Ertzberger & Martin, 2016; Jones, 2019). Perhaps highlighting that a more technical industry-focused approach to training and education is clearly a more desirable and potentially rewarding route, as students embarking on a career in football clearly need to understand a multitude of components that are involved in the sport and increase their employability prospects beyond playing (Hall et al., 2019; Stonebridge & Cushion, 2018). Furthermore, players graduating in professional football club academies less than 1% go on to play professionally

(Godfrey, 2017) and outside of these academies this is likely to be even less.

As detailed in this current study, wearable technology data, when communicated, was to primarily inform the performance for college teams. When wearable technology data was captured in a learning environment, it was evident the tutor's lacked understanding and struggled to simplify the data for student purposes (Nosek et al., 2021). This may explain why wearable technology, although a popular option with some FE providers, appears to have struggled with full inclusion in an educational context. We captured evidence of tutors using wearable technology in decontextualised settings that were devoid of a performance context. Due to the cost associated with the wearable technology units, it was not feasible for the academic members of staff to allow the students to have a unit for their own physical activity purposes and use their own data for educational purposes (e.g. basic statistical analysis, numeracy skills). Although we did not capture this data, it would be interesting to establish whether student engagement or motivation to use numeracy/statistical analysis skills would be enhanced if they were able to examine their personal physical activity or performance data.

The integration of wearable sports technology offers significant opportunities to enhance employability, indeed a recent study by Hall et al. (2019) concluded that practice-based learning in the field along with improved modes of communication and developing interpersonal skills were key requirements that increased employability prospects (Hall et al., 2019). Furthermore, in a recent review (Cushion & Townsend, 2019), it was suggested that while the use of technology has increased in football coaching, the pedagogy of coach development in relation to the use of technology and learning was weak at best. In addition, the ability to be equipped with the knowledge to translate and interpret data through various modes of communication is considered fundamental to a successful career in performance sport (Bartlett & Drust, 2020; Halson et al., 2016).

Considering the criticism levelled at FE and HE in the use and application of wearable technology, perhaps greater collaboration between the football industry and the education sector is warranted.

Such a suggestion will not be without its challenges. Firstly, the professional industry is a highly competitive and secretive world, allowing students the opportunity to apply wearable technology theory and practice in an applied setting is probably unrealistic. Saying that offering further support and additional learning opportunities may be one avenue for education providers and partner football clubs to explore. During our data capture, we did not discover a partner-relationship where a member of performance staff from a professional football club either attended the college or invited students to the professional club to explore the role and use of wearable technology in an applied professional setting. In view of the findings in this study, we suggest that more needs to be done surrounding the role and use of wearable technology and how we support individuals motivated by pursuing a career in the football industry.

We need to know more about how we embed wearable technology in an educational setting and establish some consensus on best pedagogical practice. We need to move beyond students seeing wearable technology as an enrichment activity devoid of a professional context. In other words, we need to capture the value of wearable technology and establish ways of supporting FE tutors who use it. It could be argued that in view of these findings, a bespoke qualification and training pathway more targeted on the specific technical requirements could enable graduates to successfully make the transition into the workplace. For students to graduate from FE and either advance to HE or direct employment, there needs to be an increased body of knowledge surrounding the uses and the capabilities of wearable technology used in football-related FE settings. With the number of ITPS that has grown (Pember, 2018) exponentially in recent years (Hodgson & Spours, 2019), along-side curtailment of subcontracting work in FE Colleges, regulated, not as FE colleges are (Ney, 2019). Many educational as well as sports industries adopting as well as adapting to new ways of working, including the overhaul of post-16 FE qualifications and pathways, have seen this engagement with technology specifically wearable technology rise exponentially. Given these changes, the impact of the expansion of use across education far outweighs any risks. Supporting the use of innovations such as these, as well as increased use and reliance of, and in an ever-changing sporting and educational landscape appears warranted.

Conclusion

Given the findings of this study, it is clear that in FE settings, specifically those that provide a vocational-focused pathway, regarding the use of wearable technology, there is a need to embrace change and new workings. In addition, there is a need in providing support for tutors in the form of training on the educational aspects of wearable technology, to bridge the disconnect between coaching performance and coaching education. Furthermore, modules and units need to be devised or adapted, with improved access to and better understanding of what wearable technology can offer. As well as the types of technology being able to be employed in an educational as well as a performance context, enabling students to progress confidently armed

with a greater understanding and deeper insight, thus equipping students with the necessary skills to advance successfully in employment or HE (Turick et al., 2021).

If the education industry embraced the use of appropriate wearable technology in sports education, it could make the teaching and learning interface smoother and more efficient than before. Industry must also play its part and address the many constraints, such as restrictive closed software supplied by commercial companies and lack of transparency (Kim & Chiu, 2019) sur- rounding the technology and data produced which has led many now to question. A good example of this being the many metrics and complex algorithms developed to interpret data produced from the various sensors (Luczak et al., 2020; Malone et al., 2017; Malone et al., 2020). As this current study has shown that the increase in use within education settings, then there is a commercial value here. Perhaps a manufacturer could adapt or construct a bespoke wearable technology device that is configured to capture the dynamics of performance without undermining the deeper, more human aspects of sport for educational environments.

This could be the great hope for those students with aspirations of graduating from college or university and working in the professional football industry, if not, then wearable technology could be viewed as an expensive gimmick, that offered much, but driven by marketing hype rather than genuine utility was nothing more than publicity advertising recruitment tool.

Disclosure statement

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

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