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Exploring undergraduate students' perceptions of biomechanics curricula: Are there gender differences?

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ABSTRACT

A gender gap exists across Science, Technology, Engineering, and Maths (STEM), and persists across the field of biomechanics, whereby women are underrepresented. The term 'leaky pipeline' has been used to describe the phenomenon by which women divert, or are diverted through inadequate scaffolding, from STEM pathways. This study explored undergraduate students' perceptions of biomechanics modules within sport-related degree programmes at three post-92 UK universities, with a particular focus on potential gender differences. Qualitative data from 95 students (25 women and 70 men) was collected using an online survey focussing on perceptions of biomechanics. Using reflexive thematic analysis, four key themes were developed: Difficulties with Mechanics, Practical Experience and Application, Role of Instructor or Curriculum, and Career Goals and Future Plans. Students consistently valued the practical and applied aspects of biomechanics, particularly the use of technology and real-world relevance to careers in therapy, coaching, and performance analysis. However, many reported significant challenges, especially with mathematical content, technical terminology, and data analysis. These barriers often contributed to reduced confidence and motivation, particularly among those with lower self-concept in STEM-related skills. No substantial gender-based differences in perceptions were found, suggesting that challenges and motivators are broadly shared across the student population.

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Introduction

Biomechanics combines the disciplines of Science, Technology, Engineering, and Maths (STEM) and is a fundamental example of the integration of these disciplines. The gender gap in STEM is well-established, with women making up only 35% of STEM graduates (UNESCO, 2024). Furthermore, the percentage of women holding jobs in science, engineering is reported to be only 25% (UNESCO, 2024). When considering student membership of the International Society of Biomechanics in Sports, the number of women rises to 48% (Janssen, 2021). However, the professional membership of some key biomechanics associations (e.g. International Society of Biomechanics in Sports, International Society of Biomechanics, and American Society of Biomechanics) does not diverge too much from other STEM fields, with only 32–41% of their membership being women (Ebrahimi et al., 2023; Janssen, 2021; Saul, 2020). There is also a scarcity of women in receipt of prestigious awards in the field (e.g. Muybridge Award, Geoffrey Dyson Award, and Borelli Award; Ebrahimi et al., 2023; Kean et al., 2024) and a lack of women in senior positions within biomechanics (Ebrahimi et al., 2023). Like other fields (Cooper, 2019), the proportion of women in biomechanics decreases with each career level. Although these examples represent an international perspective, they are largely focussed on high-income countries and may not fully reflect global diversity. Nevertheless, these patterns are mirrored in local contexts, including universities in the United Kingdom.

Following on from high school, and due to the modular approach adopted by most university undergraduate courses in the United Kingdom, students often can choose elective modules at levels 5 and 6 (i.e. the second and third year of a typical three-year undergraduate course, respectively). Usually, these align with the three key pillars of sport and exercise science: biomechanics, physiology, and psychology. Data from students enrolled in sports programmes at London Metropolitan University show the percentage of women enrolling in biomechanics modules drops from 16.2% in level 5

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(where women represent 20.5% of the overall cohort) to 7.1% in Level 6 (where women represent 16.9% of the overall cohort) in consecutive years. Although at St Mary's University, London, an equal proportion of men and women from sports courses enroll in biomechanics modules at Level 6 (32% of the Level 6 cohort overall, comprising equal proportions of men and women), a gender gap is evident at Level 5, where only 56% of women enrol compared to 71% of men. Often, biomechanics is perceived as more abstract and mathematically demanding than physiology or psychology (Hsieh et al., 2012; Wallace & Kernozek, 2017). To this end, research has examined the influence of factors on sports science students' modular choices in university (Felton, 2023) as well as the exploration of factors related to students' learning of biomechanics (Hsieh et al., 2012). Felton (2023) found that women students' decision to enrol in biomechanics was strongly linked to their self-confidence and previous positive experiences in the subject. However, Hsieh et al. (2012) reported no significant association between gender and levels of improvement or final grade, indicating that while selection decisions may differ by gender, the evidence does not confirm whether engagement or learning experiences differ once enrolled.

The term 'leaky pipeline' has been used to describe the phenomenon by which women divert, or are diverted through inadequate scaffolding, from STEM pathways. Laudable examples of initiatives to support women in biomechanics exist (DeVita, 2018; Harbold et al., 2021; Kean et al., 2024; Kirk et al., 2023). For example, The Perry Initiative (Harbold et al., 2021), National Biomechanics Day (DeVita, 2018; Kirk et al., 2023), and the creation of societies including International Women in Biomechanics (Ebrahimi et al., 2023) are community-driven interventions to address gender gaps in biomechanics. However, these may come at a time (i.e. postgraduate or higher) where women may have already diverged from further study or a career in biomechanics. Thus, the impact on those women yet to join relevant societies, or younger women, may be restricted. Interventions focussed on providing mentoring and role modelling to high school students have been shown to result in positive shifts in girls' perceptions of both biomechanics and engineering (Dick et al., 2024). The data in the previous paragraph suggest that the leaky pipeline may also start earlier than graduation from their first degree. Therefore, interventions aimed at university-level students may be of interest when reducing the gender gap.

Alongside initiatives to address gender disparities, changes to curriculum design could be a means through which women in universities could be retained and better engaged in the field of biomechanics. Previously, women studying STEM subjects have been reported to exhibit lower levels of self-efficacy when compared to men, despite no differences in prior knowledge or previous academic performance (Fisher et al., 2020). This may act as a barrier to biomechanics module selection and achievement (Felton, 2023; Bosch & Wilbert, 2023). To overcome this, curricula could incorporate active or experiential learning strategies (e.g. problem-based learning, flipped classrooms, or practical sessions) to contextualise abstract concepts and improve confidence (Hsieh, 2023; Knudson, 2022; Wallace et al., 2020). However, the efficacy or perception of such interventions has not been tested specifically in women cohorts in biomechanics. Further to self-efficacy, women also experience greater test anxiety, or fear of failure during exams in STEM courses (Meaders et al., 2020). Therefore, alterations to assessment design, including the use of low-stakes assessments and coursework (Felton, 2023), may also contribute towards a more positive outlook towards the curriculum. Despite the potential for changes in curriculum and assessment design to enhance the experience and retention, the impact of these through a gendered lens is underexplored.

Together, these findings suggest that while gendered differences in biomechanics engagement persist, curriculum design offers a promising avenue to improve biomechanics experiences and retention. However, the quantitative approach typically adopted (e.g. Felton (2023)) does not allow a deeper exploration of the lived experiences that shape women students' engagement with biomechanics. This is of particular importance when considering gender, where women's engagement with STEM is influenced by a multitude of factors including a lack of role models and visibility of women in related careers (Kirk et al., 2023), as well as sociological barriers including stereotyping (Carlana, 2019). The need for further research to promote greater equity and inclusion is underscored by a recent review, which found that less than 5% of pedagogical articles in sport and exercise science address these issues (Burgess et al., 2025). Therefore, the aim of this study was to investigate student perceptions of undergraduate biomechanics modules, and whether there were differences between genders and outline recommendations based on the study findings.

Methods

Study design

Data were collected using an online form (Microsoft Forms) from students enrolled in a sports-related degree (either Sports Therapy, Sport and Exercise Science, Sports Coaching, or Strength and Conditioning) across three post-92 higher education institutions (London Metropolitan University, University of Hertfordshire and St Mary's University, London). The form was completed anonymously in person during research methods (i.e. multidisciplinary) modules, and collected basic demographic data, including age, level of study (five or six, equating to second or third year in a three-year degree), course enrolled in, and gender, as well as qualitative questions to explore perceptions of biomechanics. The options available for gender were: 'Woman', 'Man', 'Non-binary', 'Other', and 'Prefer not to say'.

The questions were discussed with all authors to ensure they were clear, relevant and aligned to the research question. The questions used to explore students' perceptions of biomechanics were:

(1) 'What do you enjoy about biomechanics?'
(2) 'Can you identify some challenges and/or barriers you have faced in biomechanics?'
(3) 'How could the teaching of biomechanics be improved?'
(4) 'Describe whether biomechanics will be useful in your future career plans?'
(5) And either:
    a. 'If enrolled on an optional module, why did you choose biomechanics?'
    b. 'If not enrolled on an optional module, why did you not choose biomechanics?'

Participants

Recruitment of participants was conducted by purposive convenience sampling. Participants were eligible to take part if they were an enrolled student who had completed a first year biomechanics module and were in either level five or six. All surveys were completed between 23rd September and 17th October 2024, which coincided with the first four teaching weeks of their respective year at university. Therefore, at the time of completion, no students had completed any assessments in the academic year. Prior to completion of the forms, the study details were explained and informed consent was gathered. No incentives were offered for taking part in the study, nor were there any penalties for not participating. The study was completed in accordance with the ethical approval granted by London Metropolitan University.

Data analysis

The responses collated on Microsoft Forms were subsequently exported to Microsoft Excel. To analyse the qualitative responses, reflexive thematic analysis (Braun & Clarke, 2019) was used. A predominantly inductive approach was adopted, meaning that data-based meanings were emphasised. However, some deductive analysis was necessary to ensure that the meanings derived from the data were relevant to the research question and stakeholders, e.g. students and instructors. Until phase five, i.e. defining and naming themes, the researchers responsible for data analysis (AA and BH) were blinded to the gender of the participants. The 'familiarisation phase' consisted of reading and re-reading the entire dataset several times, with some note-taking of casual observations or trends in the data. In the second phase, through repeated iterations, both semantic and latent codes were developed. During phase three, codes were assembled into initial themes individually by AA and BH. Following this, for phase four, both AA and BH reviewed candidate themes through discussion to ensure they were meaningful interpretations of the data and were relevant to the research aims. The fifth stage consisted of naming and defining each theme, while care was taken to ensure they were representative of the data and provided an account of the data which cannot be told by the other themes. During this stage, gender information was unblinded to examine potential differences. To achieve the secondary aim of the study, the research team reviewed whether the codes and themes developed in the initial analysis were represented across genders. Once the themes were finalised and triangulated, the final phase involved the writing of the report. During this final phase, two initial themes (*Use of Equipment and Software* and *Practical Experience and Application*) were revised to form one theme.

Trustworthiness

To ensure trustworthiness, this study was designed using recognised methods and considered each of the following: credibility, transferability, dependability and confirmability (Shenton, 2004). Prior to the write-up, and to provide greater credibility of the data, the proposed themes were member-checked (McKim, 2023) by a subset of the cohort who participated in the study. Transferability was addressed through collection of demographic data, including level of study, age, and course enrolment, which will allow the reader to assess whether the findings may be applied to other institutions. The inclusion of multiple post-92 universities enhances the generalisability of the findings to similar institutions. To ensure dependability, a detailed presentation of the research process, including data collection, coding, and theme development is reported. The use of two researchers working independently to develop themes, prior to refining them collaboratively further strengthens the analysis. Confirmability was ensured using anonymised data collection and the inclusion of direct quotes to demonstrate a grounding in the data. The research team also engaged in discussions to challenge assumptions and interpretations of the data to ensure a balanced account of student perceptions.

Reflexivity

Reflexivity suggests that researchers must examine their theoretical inclinations or biases and be mindful to ensure the influence these exert on the research project are minimised (Mauthner & Doucet, 2003). The research team acknowledged that framing questions, interpretation of responses, and theme development may be influenced by their own experiences as educators and researchers in biomechanics. During data collection, anonymity was prioritised to reduce the influence of power dynamics between students and staff, ensuring students could respond freely without being identified. During the analysis, researchers engaged in reflexive journalling to document assumptions and interpretations of the data. Two researchers independently coded the data prior to jointly reviewing and refining themes. This provided a check on potential biases and an attempt at maintaining a critical stance towards the data.

Results and discussion

The aim of this study was to investigate student perceptions of undergraduate biomechanics modules, and whether there were differences between genders. An additional aim was to outline recommendations based on the study findings. Four themes were developed from the data and 18 subthemes (Table 1). Each of the themes, *Difficulties with Mechanics, Practical Experience and Application, Role of Instructor or Curriculum, and*

Table 1. Results organised into themes and subthemes and exemplar quotes.

Themes	Sub-themes	Exemplar Quotes
Difficulties with mechanics	Equations are difficult	*"Some equations and physics can sometimes be hard to fully grasp".*
	Maths is difficult	*"The biggest challenge for me is the math and numbers involved. I find the theoretical concepts interesting, but when it comes to calculations and data analysis, I tend to lose focus and get easily bored".*
	Terminology is difficult	*"Too many terms and words that they are in different language and especially when I'm not studying in my first language it's really hard for me to understand and remember".*
	Not all students had difficulties with maths, and some enjoyed it	*"I enjoyed the maths part in Biomechanics".*
	Students' perceptions of their own capability are a barrier	*"I just guessed its going to be too difficult for my non-technical mind :)"*
Practical experience and application	Students want greater number of practicals	*"Adding more practical sessions in first and second year".*
	Students want more practical application of mechanical principles	*"More practical applications and case studies in real world examples, like injury analysis, sports performance, or rehabilitation cases, can help bridge the gap between theory and practice".*
	Application of concepts is helpful when trying to understand maths/equations	*"I enjoy seeing how the equations turn into actual movements and seeing how the maths makes sense in a real world setting".*
	Use of specialist equipment and software is exciting	*"Really enjoyed the use of the technology like motion capture systems, force plates and computer simulations – exciting to work with".*
	Barriers to usage of specialist equipment	*"So far I am finding it challenging to engage with the software and still getting used to using the software".*
Role of instructor or curriculum	Helps build confidence	*"I have a little trouble with the maths. . . however the lecturers and flow of the sessions has helped me to become more confident!"*
	Delivery of materials is important to ensure understanding	*"Teachers explain everything in an amazing way that makes you understand it and they transmit their passion for it".*
	Preference for smaller group sizes	*"Length of lectures, as a student with ADHD and autism I know I learn through small group practical learning and struggled to engage with the size of the lectures".*
	Appropriate sequencing of materials is important	*"I also find that sometimes the teaching of a certain topic is not in a logical order to what comes next which can be confusing sometimes".*
Career goals and future plans	Uncertainty about the role of the biomechanics in the field	*"I also wish to work in a field involving biomechanics. . . but I am unsure of what's out there as we have not had any guidance on future roles with biomechanics".*
	Understanding how the body moves is of importance when choosing biomechanics	*"Yes, [biomechanics is] very useful as I would like to be a sport therapist/ physiotherapist, therefore knowing HOW the body moves is very important".*
	Transferable skills, e.g., data analysis and critical thinking, are seen as useful for future career plans	*"Learning biomechanics has allowed me the ability to think more logically and scientifically, rather than making assumptions about sport analysis".*
	Students more likely to choose biomechanics if it aligns with their career path	*"[I am definitely choosing biomechanics], I am in a dilemma whether to study physiotherapy or becoming a sports scientist. Either way, biomechanics will be useful in both pathways I think".*

Career Goals and Future Plans, are outlined below alongside quotes for a clear outline of the data.

Participant characteristics

Out of 449 students (147 women and 302 men) invited to take part in the study, ninety-five students (25 women and 70 men) took part in this study and were aged between 19 and 54 yr (mean ± SD: 24.6 ± 7.8 yr), representing a response rate of 21.1% (17.0% of women and 23.2% of men). Two participants were excluded from the final analysis as they were on study abroad single module programmes. Thirty-nine were second year students (Level 5; 11 women and 28 men), and fifty-six were third year students (Level 6; 14 women and 42 men). Students were enrolled in a variety of different courses including sport and exercise science (n = 49), sports therapy (n = 25), and sports coaching (n = 17), with five enrolled in strength and conditioning. When asked whether they were either choosing to take biomechanics as an optional module this year or, planning on doing so, next year, 17 students said it wasn't an option (17.7%), 34 (35.4%) said no, and 45 (46.9%) said yes.

Views consistent between genders

Although gender was a central consideration in the design of this study, a notable finding was the absence of observable differences in perceptions between men and women students. While previous literature has highlighted disparities between genders in STEM engagement and continuation, the current findings suggest that, in the context of undergraduate biomechanics modules, students of all genders share broadly similar experiences, challenges, and motivations. Therefore, the data and generated themes will be presented as consistent between genders.

Difficulties with mechanics

When students were asked to identify some barriers or challenges associated with biomechanics, the responses tended to focus primarily on mathematics, equations, and technical language on which key biomechanical principles are based. For example, participants' responses discussed mathematical elements of the subject area pointedly: *'The biggest challenge for me is the math and numbers involved. I find the theoretical concepts interesting, but when it comes to calculations and data analysis, I tend to lose focus and get easily bored'* (Student 42, L6), *'I do not understand the maths involved'* (Student 90, L6), and *'Understanding the equations and how to apply them'*. (Student 44, L6). Further to challenges associated with mathematical concepts, the technical language was also highlighted as a detractor by students: *'The understanding of technical terminology'* (Student 63, L6), *'Loads of vocabularies [sic] which is hard to remember'* (Student 29, L5), *'Also lots of big words I didn't understand so struggled to keep up'* (Student 44, L6). These presented a greater challenge for students whose first language was not English: *'Too many terms and words that they are in different language and especially when I'm not studying in my first language it's really hard for me to understand and remember'* (Student 57, L6). These challenges are consistent with previous observations, where students have difficulty mastering mechanical concepts (Knudson et al., 2003). There have been some interventions aimed at improving mastery of biomechanics concepts including active learning (Knudson, 2022), problem-based learning (Wallace et al., 2020), flipped classrooms (Hsieh, 2023), which may involve greater use of practical aspects of teaching and learning, outlined below.

For some students, it may be that their perception of their own ability with mechanical concepts act as a barrier: *'I just guessed its going to be too difficult for my non-technical mind :)'* (Student 56, L6), and *'[I wouldn't] have chosen it because the maths give me [anxiety]'* (Student 90, L6). This finding has important implications, as self-concept of subject ability influences sport students' decision on whether to choose biomechanics in elective modules (Felton, 2023). A students' perception of their own competence may also influence and be influenced by academic achievement, creating a feedback loop which may either hinder or support further learning (Bosch & Wilbert, 2023). Assessment design, specifically high-stakes examinations (Silaj et al., 2021), has been implicated with test anxiety and diminished self-confidence in other fields. Indeed, sports science students prefer modules with coursework rather than exams (Felton, 2023). However, the impact of assessment design has not been appraised in the context of biomechanics curricula. Therefore, further research may be warranted to understand how to best develop self-concept of ability in biomechanics students, with an emphasis on assessment design. This may improve retention rates of students and improve academic achievement. Another means of developing greater student interest in biomechanics is to shift focus away from mathematical processes to theoretical perspectives (Hamill, 2007).

However, not all students expressed a negative view of mathematics: *'The maths behind biomechanics is very interesting to me and I find that formulas, maths, and the physics behind it fun and enjoyable'* (Student 96, L6), *'I enjoy the logical aspect of biomechanics and how maths* *and physics play a huge part of it'* (Student 38, L6), and *'love dealing with that area of sports to be honest, with numbers etc.'* (Student 5, L5). Although speculative, these positive attitudes may be due to positive self-concept, greater levels of intrinsic motivation and interest, and positive early experiences of STEM subjects (Hsieh & Knudson, 2018). Further investigation is warranted to explore the role of these positive attitudes and assess to what extent these can be developed within biomechanics modules.

Practical experience and application

This theme was centred around student's perceptions that they felt better engaged and better able to learn what they were being taught in a practical context, and when they could see a clear application of the concepts. This was reflected in students' comments on practical sessions: *'More practical application in first year helps keep people interested – some people found it was too focused on maths'* (Student 66, L5), *'Adding more practical sessions in first and second year'*. (Student 102, L6) and some suggesting this may contribute to improved understanding: *'More practice, I think more labs could help understanding the concepts better'* (Student 22, L5). This was reflected also in comments about the application of concepts to aid understanding: *'I enjoy seeing how the equations turn into actual movements and seeing how the maths makes sense in a real world setting'* (Student 81, L6). Indeed, relating biomechanics content to student interests has previously been shown to significantly increase student engagement in biomechanics compared to generic lectures (Pliner et al., 2020).

Within practical sessions, some students identified the use of biomechanical tools as useful in promoting an understanding of movement: '[I enjoy] *the understanding of how humans move, what makes them move and the understanding of how movements are assessed using different tools e.g., force plates, 3D motion analysis'*. (Student 39, L6). Further to this, many students emphasised their enjoyment using specialist equipment and software: *'Aah [sic] have really enjoyed the use of the technology like the use of advanced tools like motion capture systems, force plates and computer stimulations [sic], which are exciting to work with'* (Student 63, L6), *'I like when doing data collection from various types of machinery'* (Student 37, L6), and *'The practical lectures, and learning to use different types of equipment in the labs! I also enjoyed learning to use excel'* (Student 30, L5). However, the use of specialist equipment and software acted as both motivating and limiting for students, where unfamiliarity with both caused some difficulties: *'A challenge I have encountered was with some of the software involved in the analysing of data'* (Student 8, L5), and *'Learning how to use equipment, can take a while to learn'* (Student 95, L6).

The perceptions shared by the students in the current study reflect previous findings demonstrating a primarily constructivist epistemology of learning in students enrolled in biomechanics classes (Knudson & Wallace, 2021). Indeed, the role of practical components ranks among the most important unit in sport and exercise science courses (Kittel et al., 2025). As mentioned by the students in the current study, the use of practical sessions provides opportunities to translate abstract theories or equations to observable movements, which has been shown to improve motivation and enhance personal responsibility for learning (Catena & Carbonneau, 2019). In turn, relevant practical experience has been suggested to enhance preparedness for work (García-Aracil et al., 2021) and improve academic performance (Catena & Carbonneau, 2019). However, significant correlations between learning and laboratory time are not always evident (Knudson et al., 2009). Interestingly, Knudson et al. (2009) demonstrated an inverse relationship between learning and laboratory expenditure, suggesting availability of specialist equipment may not necessarily be beneficial. This may reflect the challenges some students face when engaging with unfamiliar tools or software, as noted in the current study. Such difficulties could act as a distraction from core concepts and hinder meaningful engagement. However, when integrated into the curriculum appropriately, the use of these tools may provide a tangible context through which abstract concepts can be explored, enabling students to learn through experiential learning (Kolb, 1984). It is recognised that low-resourced environments may struggle to balance the need for experiential learning with student numbers, requiring a variety of active learning techniques to overcome these challenges (e.g. Tiwari et al. (2024)). Future curriculum design should therefore consider not only the integration of practical tools, but also the scaffolding and support required to ensure all students can engage meaningfully with them.

Role of instructor and curriculum

This theme centred around the recurring concern that the structure, delivery, and support provided by both instructors and curriculum shapes students' experiences. Several students highlighted the positive impact of supportive teaching on their confidence and motivation: *'I have a little trouble with the maths... however the lecturers and flow of the sessions has helped me to become* *more confident!'* (Student 101, L6), and *'Teachers explain everything in an amazing way that makes you understand it and they transmit their passion for it'* (Student 96, L6). These data align with the findings of Wilson and Ryan (2013), whereby perceived enthusiasm and immediacy of the instructor are associated with enhanced student motivation, engagement, and achievement. Instructors should therefore reflect on how to foster rapport with students and means of conveying enthusiasm.

Students also emphasised the importance of clear and accessible delivery: *'Make the explanations more simple and relate things to people better in order to understand them'* (Student 44, L6), alongside appropriate sequencing of materials: *'Sometimes the teaching of a certain topic is not in a logical order to what comes next which can be confusing sometimes'* (Student 17, L5). These reflections align with pedagogical principles which emphasise the scaffolding of complex ideas and appropriate sequencing (Belland, 2017). Students also highlighted the potential role of reduced group sizes on their engagement and understanding of the topics: *'As a student with ADHD and autism I know I learn through small group practical learning and struggled to engage with the size of the lectures'* (Student 97, L6), and *'Smaller groups during tutorials for the practical lessons or more tutors during the practicals for more thorough learning'* (Student 100, L6). Although small-group teaching is recognised as a tool to promote deeper learning, peer interaction, and inclusivity, institutional and social challenges pose barriers to its successful implementation (Mills & Alexander, 2013).

Career goals and future plans

This theme encompassed various degrees of certainty about the relevance of biomechanics to career plans, as well as a recognition of developing transferable skills and understanding of human movement. Several students expressed uncertainty about how biomechanics would fit into their career plans: *'Not sure as I don't know what role I want to go into at the moment'* (Student 79, L6), while another noted, *'I hope it will but I am not sure yet'* (Student 96, L6). This uncertainty was related to a perception of a lack of visibility or knowledge of biomechanics-related roles: *'I also wish to work in a field involving biomechanics... but I am unsure of what's out there as we have not had any guidance on future roles with biomechanics'* (Student 101, L6). However, for many students, biomechanics seemed highly relevant to future careers in therapy, coaching, and performance analysis: *'With sports therapy knowing the biomechanics of individuals gait and form will help out a lot, and injury mechanism'* (Student 47, L6), *'I want to be a performance coach, so understanding how the body moves and how to improve and optimise performance is a key area'* (Student 90, L6). Students also recognised biomechanics as a means of gaining transferable skills which may be useful in a variety of career paths: *'Developing a further understanding of data and how it can be compared to find results and new information about topics'* (Student 6, L5), *'The logical [sic] and approach of biomechanics with the application of physics and maths and the potential application of learnt principles in my ideal future career'* (Student 97, L6).

These reflections suggest that students who see a clear link between biomechanics or the analytical competencies developed within the curriculum, and their future aspirations are more likely to engage meaningfully with the subject, as has been shown previously (Felton, 2023; Hsieh et al., 2012; Park et al., 2016). In line with the findings of Felton (2023), students were more likely to choose biomechanics if they saw a clear connection to their intended profession: *'It would be a great help to learn this subject for moving forward into a career in sports therapy'* (Student 47, L6), *'I believe that Biomechanics will be a key tool in my toolbox and allow me to better analyse, understand and treat patients. Biomechanics can also be used in other fields if I decide to change career paths like designing prosthetic limbs'* (Student 62, L6), even if they did not enjoy the topic: *'It is important for my future job even though I don't really enjoy the topic in itself – I wanted to challenge myself for my own benefit'* (Student 17, L5). These findings suggest curricula may benefit from more visible career mapping, highlighting roles where biomechanics is useful, as well as highlighting the applicability of the subject to other areas. This may also enhance academic performance, as students' perception of relevance to their future careers has been shown to positively influence achievement (Hsieh et al., 2012).

Limitations

Although one of the aims was to explore gender differences in perceptions of biomechanics curricula, the sample was weighted in favour of men, which may have influenced the thematic emphasis and reduced the ability to detect gender differences. However, this imbalance is representative of the wider population of sport students at the institutions. The voluntary nature of participation may have resulted in self-selection bias. Data collection occurred early in the academic year, and before the completion of assessments, which may have influenced perceptions. Despite efforts to ensure reflexivity and minimise bias, the researchers' backgrounds in biomechanics may have influenced the framing and interpretation of data. Finally, perceptions may have been shaped by the specific design and delivery of biomechanics modules at their institutions, which may not reflect broader curricular practices. When coupled with the specific context in which the sample was drawn (i.e., three post-92 universities), caution is warranted if trying to apply these insights directly to different institution types or international settings.

Conclusions

Students consistently valued the practical aspects of biomechanics, particularly the use of technology and equipment to analyse human movement. Many students also appreciated the logical structure and real-world applicability of the biomechanics, especially when linked to performance, therapy, or coaching careers. However, students also expressed uncertainty about the relevance of biomechanics to their future careers or ongoing professional development, often due to a lack of visibility of biomechanics-related roles. This suggests a need for better career mapping or highlighting transferability of skills developed within the curriculum. Challenges were frequently reported, with mathematical content, technical terminology, and data analysis emerging as common barriers. Importantly, these difficulties did not differ between genders, suggesting that they are broadly experienced across the student population.

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