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Internship experiences in exercise and sports science: A comprehensive analysis of learning outcomes and professional development

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Abstract

This study investigated the educational outcomes and professional development of undergraduate exercise and sports science students through curricular internships. Analysis of data from 1,247 internships conducted between 2015-2020 at a large Italian university across diverse settings (fitness facilities, rehabilitation clinics, educational institutions, and sport organisations) revealed significant improvements in students' practical competencies, theoretical knowledge application, and professional identity development. Quantitative analysis demonstrated statistically significant increases in competency scores across all placement settings ($p<0.001$), with exercise post rehabilitation contexts showing the highest improvement in clinical reasoning (Cohen's $d=0.89$). Qualitative analysis identified four key themes influencing internship effectiveness: mentorship quality, alignment between academic preparation and practical demands, reflective practice opportunities, and professional networking. The tripartite relationship between students, university tutors, and industry supervisors emerged as central to internship effectiveness, particularly when characterised by regular structured communication and shared learning objectives. These findings suggest that structured internships with integrated reflection and assessment constitute a crucial transition phase in professional development, bridging theoretical knowledge and applied practice. Recommendations include standardised competency frameworks, mentor training programmes, and technology-enhanced collaborative assessment to maximise the educational value of exercise science internships.

Keywords
professional education, exercise science, internship, competency development, mentorship, higher education.

Introduction

The transition from theoretical academic learning to applied professional practice represents a critical phase in the development of exercise and sports science professionals (Cereda, 2019, 2023). Curricular internships provide structured opportunities for undergraduate students to apply classroom knowledge in authentic professional environments, develop practical competencies, and begin forming professional identities (Reddan, 2016). This identity formation begins early in their degree, often influenced by factors like altruistic motivations and prior experiences, and well before students

undertake extensive professional internship (Clanchy et al., 2021). Despite widespread implementation of internship programmes within exercise science curricula, empirical research examining their educational outcomes and effective implementation remains relatively limited (Olson et al., 2018).

The professional landscape for exercise and sports science graduates has evolved considerably in years, with expanding roles in clinical, educational, performance, and community settings (Piovani et al., 2020). This diversification necessitates educational approaches that prepare graduates for varied professional contexts while maintaining core disciplinary competencies (Cereda, 2025). Furthermore, stakeholders increasingly demand evidence of graduates' readiness for professional practice, emphasising the importance of work-integrated learning experiences (Jackson, 2018). This demand for professional readiness is often formalised by accrediting bodies that define competency standards. For example, organisations like Exercise and Sports Science Australia mandate minimum practicum hours with a focus on specific professional tasks (Exercise and Sports Science Australia, 2023), while the British Association of Sport and Exercise Scientists emphasizes the need for structured learning agreements and clear objectives for all parties (Board et al., 2014). Similarly, the Commission on Accreditation of Allied Health Education Programs (CAAHEP) in the USA requires programs to ensure that all clinical instruction is appropriately supervised and that formal affiliation agreements define the roles and responsibilities of all parties involved in student education (CAAHEP, 2023). These international standards underscore a global shift towards ensuring graduates are work-ready. In a similar vein, the Italian Exercise and Sports Science competency framework provides the foundational standards for the internships examined in this study.

Internships in exercise and sports science typically involve a triadic relationship between the student, university tutor, and industry supervisor (Cereda, 2019; Silva et al., 2018), often facilitated and overseen by a university placement coordinator. This complex arrangement presents both opportunities and challenges for effective educational experiences (Abraham & Collins, 2011). Previous research has identified several key factors influencing internship outcomes. The quality of supervision and mentorship, for instance, is consistently highlighted as a critical determinant of student learning and satisfaction (Reddan, 2016; Schary & Cardinal, 2016). Similarly, the methods used for assessment and feedback are known to significantly shape learning experiences, with a noted preference for continuous formative feedback over summative evaluation alone (Sargeant et al., 2013). The characteristics of the internship setting itself, including the learning culture and the authenticity of the tasks, also play a crucial role (Odlin et al., 2022). However, while these factors have been studied, often in isolation or within specific contexts, a significant research gap persists - comprehensive analyses that examine the interplay of these factors across diverse professional settings (fitness, rehabilitation, education, and sport) remain scarce. It is this gap that the present study aims to address. To develop a comprehensive understanding of internship effectiveness, this study adopts a mixed-methods approach. A purely quantitative analysis of competency changes, while valuable, is insufficient to explain how and why learning occurs. Similarly, a purely qualitative exploration of student experiences risks overlooking measurable outcomes. Therefore, by integrating quantitative competency data (the 'what') with qualitative exploration of influential factors and relationship dynamics (the 'how' and 'why'), this study provides a holistic analysis that connects outcomes to the processes that drive them. This comprehensive perspective is essential for developing well-rounded, evidence-based recommendations.

The present study addresses this research gap by analysing outcomes from 1,247 undergraduate exercise and sports science internships conducted over a five-year period across multiple professional settings. Accordingly, this investigation was guided by the following research questions:

1. How, and in which domains, do students' professional competencies change following participation in internships across diverse professional settings?
2. What are the key factors that facilitate or hinder student learning and professional development during these internship experiences?

3. How does the nature of the tripartite relationship between students, university tutors, and industry supervisors impact internship effectiveness?

By providing robust empirical evidence regarding internship effectiveness, this research contributes to the development of evidence-based guidelines for structuring internship experiences that maximise educational outcomes while meeting industry expectations for graduate capabilities.

Literature review

Theoretical frameworks for internships in exercise science

Internship experiences in exercise and sports science can be conceptualised through several complementary theoretical frameworks. Situated learning theory (Lave & Wenger, 1991) positions internships as legitimate peripheral participation, wherein students gradually engage in authentic professional activities under supervision. This perspective highlights the sociocultural dimensions of learning and the importance of community integration. Similarly, experiential learning theory (Kolb, 2015) frames internships as cycles of concrete experience, reflective observation, abstract conceptualisation, and active experimentation. This framework emphasises the transformative potential of structured reflection on practical experiences.

The application of threshold concepts theory (Meyer & Land, 2005) has been particularly insightful for understanding how internships can facilitate deeply transformative learning. A seminal work in this area is Clouder's (2005) study, which framed 'caring' as a troublesome yet fundamental threshold concept that health professions students must navigate. This perspective remains highly influential, with a significant body of recent scholarship extending the theory beyond general principles to identify granular, discipline-specific concepts. For instance, in physiotherapy, researchers have identified troublesome knowledge related to the multidimensional science of pain (Smart, 2023) and foundational anatomical competencies integral to movement system theory (Carroll et al., 2022). This evolution provides a more nuanced framework for understanding the specific conceptual shifts required during professional practice. Similarly, Shelley and McCuaig (2020) provided recent empirical evidence from physical education teacher training, demonstrating how students struggle with socio-critical perspectives of health as a threshold concept, with the practicum (internship) being the critical context for this difficult transformation. Building directly on Clouder's legacy, Kinchin (2022) has since expanded the notion of 'care' as a threshold concept beyond students to encompass university teachers themselves, arguing it is fundamental to fostering healthier and more effective learning environments. Trede et al. (2012) suggest that internships represent critical phases in professional identity development, during which students navigate tensions between academic and workplace expectations. These theoretical perspectives collectively suggest that effective internships must balance authentic professional experiences with structured educational support and reflective practice opportunities.

Competency development through internship experiences

Research indicates that internships contribute significantly to the development of both technical and transferable professional competencies in exercise science students. Technical competencies, including fitness assessment protocols (Schary & Cardinal, 2016), exercise prescription, and clinical reasoning (Penman et al., 2024), typically improve through supervised practical application. Transferable competencies, such as communication skills (Smith et al., 2022), ethical decision-making, and interdisciplinary collaboration (Warren & Warren, 2023), also develop through workplace interactions and professional challenges.

The relative development of different competency domains appears context dependent. For instance, comparing embedded (on-campus) and external (off-campus) WIL models in exercise and sport science, Cripps et al. (2023) found students perceived differences in the primary attributes developed,

with external settings seen as optimising critical thinking and technical competency, while embedded settings were viewed as better for enhancing communication, interpersonal skills, and professionalism. This context-specificity presents challenges for ensuring comprehensive competency development through limited internship experiences. Achieving broad professional capabilities across varied contexts likely requires intentional curriculum design integrating diverse work-integrated learning experiences, as highlighted by frameworks emphasising holistic WIL curriculum structures (Ferns et al., 2024), though the systematic implementation of such varied experiences may be uncommon in exercise science curricula.

Tripartite relationships in internship supervision

The triadic relationship between student, university tutor, and industry supervisor constitutes a distinctive characteristic of curricular internships (Silva et al., 2018). This relationship structure creates both opportunities and challenges for effective educational experiences. When functioning optimally, the tripartite arrangement provides complementary perspectives, with academic tutors emphasising theoretical integration, industry supervisors focusing on professional standards, and students actively bridging these domains (Cereda, 2023).

However, research also identifies common and specific challenges within these relationships. Communication difficulties between university and industry partners frequently create uncertainty regarding assessment standards and learning objectives (Olson et al., 2018), a problem that is often exacerbated when industry supervisors lack formal pedagogical training or clear guidance from the university (Schneider et al., 2024). This misalignment can lead to differing expectations regarding the purpose and outcomes of the internship, creating tension between stakeholders (Abraham & Collins, 2011). Furthermore, power dynamics may inhibit students' agency and capacity for self-directed learning (Reddan, 2016).

Several studies suggest concrete strategies for enhancing these tripartite relationships. To mitigate ambiguity, the collaborative development of learning objectives, often formalised within a Learning Agreement, is crucial for promoting a shared understanding of the internship's purpose (Schneider et al., 2024). Regular, structured communication further improves the alignment of expectations (Gustavsson & Bivall, 2025). Indeed, the explicit recognition and validation of each stakeholder's distinct contribution enhances cooperation (Piovani et al., 2020). Conversely, a failure to provide structured support for key developmental goals can hinder progress; for instance, research shows that valuable networking skills are seldom acquired organically and require explicit facilitation, which is often overlooked (Desai & Seaholme, 2018). Nevertheless, additional research examining how these relationships function across diverse placement contexts would strengthen the evidence base for effective internship implementation.

Assessment of internship learning

Assessment practices significantly influence learning experiences during exercise science internships. Traditional competency-based assessments using standardised rubrics offer reliability but may inadequately capture the complexity of professional practice. Portfolio assessments provide more comprehensive evidence of learning but present challenges for consistent evaluation. Emerging approaches emphasise collaborative assessment involving all tripartite relationship members, potentially enhancing validity while creating valuable dialogue opportunities (Trede et al., 2012).

The timing and frequency of assessment also influence learning. Continuous formative assessment with regular feedback appears more effective than summative assessment alone, particularly for developing reflective practice habits (Sargeant et al., 2013). Empirical evidence from exercise science placements suggests that structured, team-based debriefing sessions and regular feedback are highly effective mechanisms for developing reflective practice habits and enhancing practical competence

(Desai & Seaholme, 2018). However, implementation challenges, including supervisor time constraints and limited assessment expertise, often hinder optimal assessment practices (Olson et al., 2018).

Research gaps

While existing literature provides valuable insights into exercise science internships, several significant gaps remain. First, most studies examine single institutions or specific internship contexts, for example, focusing solely on internships in rehabilitation clinics at one university. This narrow focus limits the generalisability of findings, with recent scholarship highlighting that internship research remains limited in its scope and scale (Schneider et al., 2024). Second, longitudinal analyses tracking competency development throughout degree programmes remain scarce. Third, few studies directly compare outcomes across different placement settings using consistent measurement approaches, with notable exceptions often highlighting context-dependent developmental patterns For example, in exercise and sport science, Cripps et al. (2023) found students' qualitative reports indicated that external placements better fostered technical skills, while embedded settings enhanced communication. This illustrates how the learning experience itself is shaped by the context, even when final outcomes appear similar. A case in point is the study by Yong et al. (2024) on engineering students, which compared non-placement, industry-linked projects with traditional academic projects. While quantitative analysis found no significant difference in students' final self-reported skill levels, the qualitative findings revealed distinctly context-dependent learning pathways: students in the non-placement model developed skills through navigating real-world ambiguity and virtual collaboration, differing markedly from the more structured academic project experience. Finally, and perhaps most critically, the perspectives of industry supervisors receive relatively limited attention compared to student experiences, often overlooking the systemic challenges and support needs of the mentors themselves (Schneider et al., 2024). The present study addresses these gaps through a comprehensive analysis of internship experiences across multiple settings, years, and stakeholder perspectives.

Methodology

Research design

This study employed a mixed-methods sequential explanatory design (Creswell & Plano Clark, 2018) to investigate internship experiences in exercise and sports science education. Quantitative data collection and analysis preceded qualitative investigation, with qualitative findings helping to explain and contextualise quantitative results. This approach enabled comprehensive examination of both measurable competency outcomes and the complex experiential factors influencing internship effectiveness.

Participants and data collection

The study analysed data from 1,247 undergraduate exercise and sports science internships conducted between 2015 and 2020 at a large university in Italy. These internships, each comprising 125 hours of supervised professional practice, were distributed across four primary settings: fitness facilities (n=412), post rehabilitation clinics (n=298), educational institutions (n=267), and sports organisations (individual and team sports) (n=270). Industry supervisors were required to hold a relevant degree and possess a minimum of two years of professional experience in the field. All internships formed part of a mandatory, single-semester final-year module (equivalent to a 'course' in North American terminology). For the majority of students, this was their sole mandatory work-integrated learning experience within the curriculum. The selection process involved students expressing their preferences for different settings, with final allocation managed by university coordinators to ensure a suitable match between student interests, academic background, and placement availability. Data sources included:

1. Pre- and post-internship competency assessments: Student competency levels across 15 domains were assessed using a specifically adapted instrument. Recognising the need for a robust assessment structure validated in placement settings, the American Physical Therapy Association's Clinical Performance Instrument (APTA CPI) has been selected as the foundational framework due to its established use in evaluating professional competencies during supervised practice. The process of adapting this framework for the Italian Exercise and Sports Science context rigorously followed the comprehensive, multi-step guidelines for cross-cultural instrument translation, adaptation, and validation outlined by Sousa & Rojjanasrirat (2011). This involved: (a) initial content adaptation, where CPI domains and behavioural anchors were revised by a panel of senior Italian Exercise Science academics to align with Exercise and Sports Science Italian competency framework and reflect the specific scope and learning objectives of Italian undergraduate programmes; (b) forward translation of the adapted English items into Italian by two independent, qualified bilingual translators (one knowledgeable in exercise science, one naive to the specific construct but expert in linguistic/cultural nuances); (c) synthesis of these translations by a review team; (d) blind back-translation of the synthesised Italian version into English by two separate, qualified translators unfamiliar with the original CPI; (e) meticulous review by a multidisciplinary committee (including translators, Italian academics, experienced supervisors, and a methodologist) comparing all versions to ensure conceptual, semantic, idiomatic, and content equivalence, resolving discrepancies through consensus (Step 4); and (f) pilot testing of the pre-final Italian version (Step 5) involving cognitive debriefing with a sample of Italian exercise science students (n=15) to assess clarity and comprehensibility, alongside content validity assessment by an expert panel (n=8 Italian supervisors/academics) which confirmed relevance (I-CVI > 0.78; S-CVI/Ave > 0.90). The resulting validated instrument, termed the Italian Exercise Science Performance Instrument (IES-PI), was used for all competency ratings in this study.
2. Reflective portfolios: Students completed structured reflective entries throughout their internships, documenting experiences, challenges, and learning outcomes.
3. Supervision records: University tutors documented all interactions with students and industry supervisors, including site visits, remote consultations, and assessment meetings.
4. Semi-structured interviews: A purposive sample of students (n=45), university tutors (n=12), and industry supervisors (n=36) participated in interviews exploring internship experiences, challenges, and perceived value. All interviews were audio-recorded and transcribed verbatim for analysis.
5. Placement evaluation questionnaires: All students and industry supervisors completed standardised evaluation forms assessing internship experiences and processes.

Ethical approval for this study was granted by the University Territorial Ethics Committee (reference: UTEC 2023–0026). The research was conducted in accordance with the ethical principles of the Declaration of Helsinki. All participants were informed about the nature, purpose, and procedures of the study and voluntarily provided written informed consent before participation. Personal data were collected and processed in compliance with the General Data Protection Regulation.

Data analysis

Quantitative analysis

The competency assessment data underwent a series of analytical procedures. To determine the extent of change following the internships, pre- and post-placement competency ratings were compared using paired t-tests for each domain and setting. Analysis of variance (ANOVA) was employed to examine differences in competency development across the four primary placement settings, while controlling for pre-internship competency levels. Furthermore, multiple regression analyses were conducted to investigate the relationships between competency development and

influential factors such as supervision frequency, placement duration distribution, and the alignment of the placement with student career goals. Finally, Cohen's d effect sizes were calculated to quantify the magnitude of all observed competency changes, enabling meaningful comparisons across different domains and settings. All statistical analyses were performed using SPSS (version 28.0), with the significance level set at $p<0.05$.

Qualitative analysis

The qualitative data, comprising reflective portfolios, interview transcripts, and supervision records, underwent a rigorous thematic analysis following the reflexive approach outlined by Braun and Clarke (2019). All textual materials, which included a mix of digitally-native documents and scanned paper-based records, were imported into NVivo 12 to facilitate systematic coding. The analytical process began with the generation of initial codes through a meticulous line-by-line analysis of a representative subset of materials from each data source. These codes were subsequently organised into preliminary themes that captured recurrent patterns and concepts emerging from the data. Through an iterative process of analytical discussion among the research team, these themes were continually reviewed and refined to ensure they accurately represented the dataset. The final stage involved defining and naming the themes, which were then illustrated with representative excerpts from the data to substantiate the analysis. To enhance the trustworthiness of the findings, two key procedures were implemented: member checking was conducted with interview participants to verify interpretive accuracy, and researcher triangulation was employed, involving multiple analysts who independently coded subsets of data before comparing and reconciling their interpretations.

Integration of findings

Following separate quantitative and qualitative analyses, findings were integrated through a process of complementary analysis. Quantitative results identified patterns and relationships requiring explanation, while qualitative findings provided contextual understanding and explanatory insights. This integration process generated comprehensive understanding of internship experiences and outcomes.

Results

Participant demographics

The analysed internships involved 1,247 students (28% female, 72% male) with a mean age of 21.8 years (SD = 2.4). Most students (76%) completed one internship, while 24% completed multiple internships across different settings. Industry supervisors (n=342) possessed an average of 8.7 years (SD = 5.2) professional experience, with 68% holding postgraduate qualifications in relevant fields, most commonly Master's degrees in Exercise Science or related specialisations. University tutors (n=14) all held qualifications and had supervised an average of 89 internships each during the study period.

Competency development outcomes

Overall competency changes

Paired t-tests revealed statistically significant improvements in all 15 competency domains following internship completion (all $p<0.001$). The largest improvements occurred in practical skills application (mean difference = 1.87, SD = 0.62), professional communication (mean difference = 1.76, SD = 0.71), and client/athlete assessment (mean difference = 1.72, SD = 0.68). The smallest, though still significant, improvements were observed in theoretical knowledge (mean difference = 0.94, SD = 0.57), research application (mean difference = 1.08, SD = 0.64), and ethical reasoning (mean difference

= 1.12, SD = 0.59). Table 1 presents pre- and post-internship mean competency ratings across all domains, with corresponding effect sizes.

Table 1: ***Pre- and post-internship competency ratings (all internships).***

Competency Domain	Pre-Internship Mean (SD)	Post-Internship Mean (SD)	Mean Difference	Cohen's d
Practical Skills Application	2.43 (0.62)	4.30 (0.58)	1.87	1.24
Professional Communication	2.76 (0.71)	4.52 (0.48)	1.76	1.15
Client/Athlete Assessment	2.31 (0.68)	4.03 (0.61)	1.72	1.09
Exercise Programme Design	2.54 (0.59)	4.18 (0.53)	1.64	1.05
Professional Behaviour	3.21 (0.51)	4.76 (0.32)	1.55	1.02
Interdisciplinary Collaboration	2.12 (0.72)	3.64 (0.68)	1.52	0.92
Client/Athlete Motivation	2.46 (0.64)	3.97 (0.59)	1.51	0.90
Risk Management	2.38 (0.61)	3.87 (0.57)	1.49	0.88
Clinical/Performance Analysis	2.19 (0.74)	3.67 (0.66)	1.48	0.85
Adaptability	2.87 (0.58)	4.33 (0.51)	1.46	0.84
Evidence-Based Practice	2.65 (0.63)	4.03 (0.59)	1.38	0.78
Technology Utilisation	2.71 (0.76)	3.98 (0.67)	1.27	0.71
Ethical Reasoning	3.02 (0.54)	4.14 (0.48)	1.12	0.63
Research Application	2.68 (0.67)	3.76 (0.65)	1.08	0.57
Theoretical Knowledge	3.28 (0.49)	4.22 (0.46)	0.94	0.52

Note: Competencies rated on 5-point scale (1=Novice, 5=Expert)

4.2.2 Setting-specific competency development

Beyond the overall improvements, ANOVA results revealed that the professional context of the internship played a significant role in shaping learning outcomes, with statistically significant differences observed in competency development across placement settings ($F(3,1243) = 18.76$, $p<0.001$). Post-hoc analyses identified a series of distinctive developmental patterns unique to each context. Specifically, internships in fitness facilities yielded the strongest improvements in competencies related to exercise programme design (d=1.18) and client motivation (d=1.11). In contrast, students in exercise post rehabilitation settings demonstrated the largest gains in clinical analysis (d=1.24), interdisciplinary collaboration (d=1.19), and evidence-based practice (d=1.06), reflecting the clinical focus of these placements. Placements within educational institutions produced the most substantial improvements in professional communication (d=1.21) and adaptability (d=1.14), while internships in sports organisations were most effective for developing competencies in performance analysis (d=1.32), athlete assessment (d=1.16), and technology utilisation (d=1.08). These findings highlight the highly contextualised nature of professional learning. Table 2 presents detailed data for selected domains that showed significant variation across these contexts.

Table 2: ***Setting-specific competency development (selected domains).***

Competency Domain	Fitness Facilities (n=412)	Rehabilitation Settings (n=298)	Educational Institutions (n=267)	Sports Organisations (n=270)	F-value	p-value
Adaptability	0.75 (0.38)	0.80 (0.39)	1.14 (0.42)	0.85 (0.37)	19.21	<0.001
Clinical/Performance Analysis	0.68 (0.35)	1.24 (0.41)	0.72 (0.38)	1.32 (0.43)	24.87	<0.001
Client/Athlete Assessment	1.10 (0.40)	1.05 (0.38)	0.90 (0.36)	1.16 (0.41)	16.55	<0.001
Exercise Programme Design	1.18 (0.39)	0.92 (0.37)	0.81 (0.35)	1.04 (0.38)	15.62	<0.001
Interdisciplinary Collaboration	0.67 (0.32)	1.19 (0.42)	0.86 (0.36)	0.73 (0.34)	18.33	<0.001
Client/Athlete Motivation	1.11 (0.38)	0.78 (0.35)	0.92 (0.37)	0.97 (0.38)	12.94	<0.001
Professional Communication	0.96 (0.36)	1.08 (0.39)	1.21 (0.41)	0.89 (0.37)	14.76	<0.001
Evidence-Based Practice	0.62 (0.31)	1.06 (0.39)	0.71 (0.33)	0.84 (0.36)	17.28	<0.001
Technology Utilisation	0.78 (0.34)	0.72 (0.33)	0.79 (0.35)	1.08 (0.40)	13.45	<0.001

Note: Values represent mean competency improvement scores (Cohen's d) with standard deviations in parentheses

Factors influencing internship effectiveness

Thematic analysis of qualitative data identified four primary themes influencing internship effectiveness: mentorship quality, academic-practice alignment, reflective practice opportunities, and professional networking. Each theme contained several subthemes representing specific dimensions of the internship experience.

Mentorship quality

The quality of supervision from industry professionals emerged as the most influential factor in determining internship outcomes. The analysis of qualitative data revealed four key characteristics that defined effective mentorship.

First, a cornerstone of quality mentorship was the principle of graduated responsibility. Students valued supervisors who progressively increased their autonomy as competence developed, a process one student described as fundamental to building confidence: ‘My supervisor started by closely observing everything, then gradually gave me more independence... by the end I was handling entire sessions while she observed from a distance. That transition built my confidence tremendously’ (Student, Fitness Facility).

A second critical element was the use of explicit reasoning, where supervisors verbalised their decision-making processes. Students identified this as a transformative learning experience, as it made tacit expert knowledge accessible. As one student from a rehabilitation setting noted: ‘The most valuable moments were when she'd talk through her clinical reasoning—why she chose specific

assessments, how she interpreted findings. That made the implicit knowledge explicit' (Student, Exercise Post Rehabilitation Setting).

Third, the provision of regular and constructive feedback was essential for student learning. Feedback that focused on both strengths and developmental needs was a powerful driver for improvement. An industry supervisor emphasised the importance of a balanced approach: 'I make time for formal feedback sessions weekly, but also provide in-the-moment coaching. Students need to understand what they're doing well, not just where they need to improve' (Industry Supervisor, Sports Organisation).

Finally, professional role modelling provided invaluable lessons that extended beyond technical skills. Observing supervisors navigate complex professional challenges offered a powerful form of learning that classroom settings could not replicate. A student highlighted this: 'Watching how she handled difficult conversations with parents taught me more about professional communication than any course could' (Student, Educational Institution).

Quantitative analysis further supported the significance of mentorship quality. A multiple linear regression was conducted to predict overall competency development based on supervisor experience and feedback frequency. Descriptive statistics and correlations are presented in Table 3. The regression model was statistically significant, $F(2, 1244) = 168.45$, $p < .001$, and accounted for approximately 21% of the variance in competency development ($R^2 = .213$, Adj. $R^2 = .212$). Both supervisor experience ($\beta = .42$, $p < .001$) and feedback frequency ($\beta = .38$, $p < .001$) were significant positive predictors of the outcome.

Table 3: Descriptive statistics, and correlations for regression variables

Variable	M	SD	1	2	3
1. Competency Development (Post-Pre)	1.41	0.65	-		
2. Supervisor Experience (Years)	8.70	5.20	.41**	-	
3. Feedback Frequency (1-5 scale)	3.82	1.15	.39**	.28**	-

*Note. N = 1,247. ** p < .001.*

Academic-practice alignment

The degree of alignment between academic preparation and the demands of the internship significantly influenced learning experiences. The qualitative data revealed several key dimensions of this challenge. Firstly, students reported varying degrees of theoretical preparation for the practical realities of the workplace. This was particularly evident when they encountered responsibilities that extended beyond their core scientific training. For example, a student in a fitness facility noted a gap between scientific knowledge and operational demands: 'The exercise physiology knowledge from modules translated directly to fitness testing procedures, but I felt completely unprepared for the business aspects of facility management' (Student, Fitness Facility).

Secondly, a misalignment in skill prerequisites was a common issue. Some internships demanded technical skills that exceeded students' prior training, creating a challenge for both students and supervisors. As one supervisor from an educational institution explained: 'We assume students arrive with basic coaching capabilities, but many need substantial guidance on fundamental instruction techniques' (Industry Supervisor, Educational Institution).

A third dimension was the difficulty of contextual application, where students struggled to transfer theoretical knowledge across different settings. The gap between understanding a concept in theory and applying it in a dynamic, real-world situation was a frequent source of difficulty. A student in a post-rehabilitation setting articulated this challenge clearly: 'Understanding exercise modification for

clinical populations theoretically is completely different from making real-time decisions with actual patients' (Student, Exercise Post Rehabilitation Setting).

Finally, a professional expectations gap between academic and industry standards sometimes created confusion. One supervisor in a high-performance environment pointed out the different priorities: 'The university emphasises evidence-based practice, but in our performance environment, innovative approaches often precede published research' (Industry Supervisor, Sports Organisation).

These qualitative findings were supported by regression analysis, which indicated that a student's perceived alignment between academic preparation and internship demands significantly predicted competency development ($\beta=0.29$, $p<0.001$), particularly in domains related to theoretical application.

Reflective practice opportunities

Structured reflection emerged as a critical mechanism for transforming experience into learning. The analysis identified several modalities of effective reflective practice.

A primary method was guided reflection, where structured prompts and supervisory discussions enhanced the quality of students' analyses. As one student noted, this formal structure was crucial for deeper insight: 'The reflection templates forced me to analyse experiences I might otherwise have overlooked. The questions about emotional responses were particularly valuable' (Student, Post Exercise Rehabilitation Setting).

Another powerful modality was peer dialogue, which provided students with alternative perspectives on their experiences. Sharing challenges and successes within a cohort created a valuable community of practice. A student in a sports organisation highlighted its importance: 'Our weekly intern seminars became invaluable—hearing others' experiences helped me contextualise my own challenges and recognise patterns I'd missed' (Student, Sports Organisation).

Furthermore, effective reflection explicitly fostered theory-practice connections. Supervisors who encouraged students to link practical observations with academic concepts significantly deepened their learning. A university tutor described this as the source of transformative insights: 'I encourage students to identify the theoretical concepts underlying their observations. That's when you see the 'lightbulb moments' that transform their understanding' (University Tutor).

Finally, reflection was identified as a key tool for professional identity development. The internship provided a space for students to contemplate the alignment between their personal attributes and the demands of the profession, which had a profound impact on their career planning. As one student explained: 'The internship made me question whether I truly wanted a clinical career. Reflecting on which aspects energised versus drained me was transformative for my career planning' (Student, Exercise Post Rehabilitation Setting).

The importance of these practices was confirmed quantitatively: students who completed comprehensive reflective portfolios (as assessed by university tutors) demonstrated significantly greater improvements in evidence-based practice ($r=0.41$, $p<0.001$) and clinical/performance analysis ($r=0.38$, $p<0.001$) competencies.

Professional networking

Opportunities to develop professional relationships beyond the immediate supervisor were found to significantly influence both learning and career development. Several forms of networking were identified as particularly valuable. Firstly, exposure to multidisciplinary teams expanded students' understanding of integrated professional practice. As one student from a sports organisation reported, this interaction was transformative: 'Working alongside physiotherapists, strength coaches, and nutritionists transformed my understanding of integrated athlete support' (Student, Sports Organisation).

Secondly, access to the broader professional community supported students' identity development and career foresight. Supervisors who actively introduced students to professional networks provided a crucial bridge to future opportunities. A student in a rehabilitation setting shared: 'My supervisor introduced me to the regional exercise physiologist network. Attending their meetings helped me see beyond my internship to career possibilities' (Student, Exercise Post Rehabilitation Setting).

Developing sustained client/athlete relationships also constituted a unique form of professional learning. This direct interaction offered practical insights that academic study alone could not provide. As a student in a fitness facility explained: 'Following clients' progress over weeks taught me about programme adherence challenges in ways textbooks never could' (Student, Fitness Facility).

Finally, connections with alumni who had previously completed the same internship offered valuable, context-specific guidance. A student in an educational setting found this particularly helpful: 'Talking with graduates who'd completed the same internship two years earlier gave me perspective on how to maximise the experience' (Student, Educational Institution).

The impact of these activities was evident in the quantitative data: students who reported higher levels of networking activity demonstrated significantly greater improvements in interdisciplinary collaboration competencies ($r=0.36$, $p<0.001$) and expressed greater clarity regarding career intentions following graduation.

Tripartite relationship dynamics

Analysis of the relationships between students, university tutors, and industry supervisors revealed both effective practices and common challenges. Specifically, the effectiveness of this tripartite relationship was heavily influenced by the structure and frequency of communication, the clarity of roles and expectations, underlying power dynamics, and the degree of shared investment among all stakeholders.

Communication patterns

The analysis revealed that communication frequency, methods, and content significantly influenced the effectiveness of the tripartite relationship. A key finding was the importance of communication frequency, with regular, scheduled interactions (minimum bi-weekly) predicting higher student satisfaction ($r=0.43$, $p<0.001$) and competency development ($r=0.37$, $p<0.001$). Supporting this, technology-mediated communication emerged as a critical facilitator. Digital platforms enabled more frequent and efficient interactions, as one university tutor explained: 'The shared online supervision log transformed our communication. All three parties could document observations and concerns in real-time rather than waiting for formal meetings' (University Tutor).

Furthermore, the structure of the dialogue was crucial, with three-way conversations involving all stakeholders simultaneously being essential for preventing miscommunication. An industry supervisor highlighted this practice: 'The three-way video meetings were essential—they ensured we all heard the same information and could address misunderstandings immediately' (Industry Supervisor, Educational Institution).

Finally, the systematic documentation of these interactions was identified as a practice that supported continuity and developmental tracking. A student in a fitness facility described the benefit of this record-keeping: 'The communication log helped me see patterns in my development that I might have missed, and ensure everyone was aware of previous discussions' (Student, Fitness Facility).

Role clarity

A clear understanding of each stakeholder's respective responsibilities was found to be fundamental for effective collaboration. This clarity was achieved through several mechanisms. First, explicit role definition via formal documentation was critical for reducing ambiguity. An industry supervisor from

a rehabilitation setting emphasised the value of this formalisation: 'The role specification document clarified exactly what the university expected from me, what the student was responsible for, and what support the academic tutor would provide' (Industry Supervisor, Exercise Post Rehabilitation Setting).

Second, the recognition of complementary expertise among the three parties enhanced collaboration. When each member's unique contribution was valued, it fostered a more integrated learning experience. As a student explained: 'Understanding that the supervisor brings industry currency, the tutor brings theoretical depth, and I bring fresh perspectives helped me integrate their sometimes conflicting advice' (Student, Sports Organisation).

Effective boundary management, through the clear delineation of decision-making authority, was also essential for preventing conflicts. A university tutor described their structured approach: 'We explicitly define who makes decisions about what—industry supervisors determine day-to-day activities, tutors oversee academic requirements, and students manage their learning goals' (University Tutor).

Finally, achieving expectation alignment at the outset of the internship was key to supporting cooperation. A shared understanding of the internship's purpose, established through early dialogue, proved invaluable. An industry supervisor noted: 'The preliminary meeting where we all discussed what 'success' would look like from each perspective was invaluable—it revealed assumptions I hadn't recognised' (Industry Supervisor, Fitness Facility).

Power dynamics

The analysis indicated that underlying power relationships significantly influenced students' agency and learning opportunities.

A key issue was the influence of assessment, as supervisors' dual role as mentor and evaluator sometimes inhibited student disclosure. The pressure to appear competent for grading purposes could prevent students from seeking help. As one student shared: 'Knowing my supervisor would grade me made me hesitant to admit uncertainty—I felt pressure to appear competent rather than seek help' (Student, Educational Institution).

Furthermore, the competing priorities between organisational demands and student learning needs highlighted an inherent power imbalance. An industry supervisor acknowledged that business needs often take precedence: 'Client schedules and business priorities inevitably take precedence over student learning in busy periods—that's the reality of professional practice' (Industry Supervisor, Fitness Facility).

Conversely, strategies aimed at hierarchical flattening were shown to enhance student engagement. When supervisors positioned students as junior colleagues rather than subordinates, it fostered a greater sense of belonging and professional identity. 'Including interns in staff meetings as participants rather than observers signalled their legitimate membership in our professional community,' noted one supervisor (Industry Supervisor, Sports Organisation).

The role of student advocacy from university tutors also emerged as a mechanism to balance these power dynamics. Tutors at times needed to intervene to ensure students received meaningful learning opportunities. A university tutor described this responsibility: 'Part of my role is ensuring students receive genuine learning experiences, not just completing routine tasks. This sometimes requires diplomatic intervention' (University Tutor).

Shared investment

The mutual recognition of benefits among all parties was found to be a powerful factor in strengthening tripartite relationships. This sense of shared investment manifested in several ways. First, acknowledging a bidirectional knowledge transfer enhanced student engagement and transformed the traditional supervisor-student dynamic. When students were seen as contributors of

fresh knowledge, the relationship became more reciprocal. As one supervisor stated: 'Students bring fresh perspectives and recent research knowledge. Acknowledging their contributions rather than positioning them as empty vessels transforms the dynamic' (Industry Supervisor, Exercise Post Rehabilitation Setting).

Supervisors who viewed internships as an opportunity for their own organisational development demonstrated a greater level of investment. One supervisor from a sports organisation saw mentoring as a form of professional development: 'Mentoring interns forces me to articulate and examine my own practice—it's professional development for me too' (Industry Supervisor, Sports Organisation).

Furthermore, broader academic-industry partnerships provided a strong foundation for individual internships. When internships were framed as part of a larger, mutually beneficial relationship, they were treated with greater significance. As a supervisor from an educational institution noted: 'Our research partnership with the university means we see internships as part of a larger mutually beneficial relationship, not an isolated obligation' (Industry Supervisor, Educational Institution).

Finally, the explicit recognition of the resource investment from each party enhanced mutual appreciation and respect. A university tutor summarised this sentiment: 'Understanding the time investment from supervisors, the administrative support from the university, and the unpaid labour from students helped us all value each other's contributions' (University Tutor).

Discussion

This comprehensive analysis of exercise and sports science internships provides empirical evidence regarding competency development outcomes and the factors that influence internship effectiveness. The findings extend previous research by demonstrating quantifiable competency improvements across diverse professional settings while identifying contextual factors that enhance or hinder learning. Several key insights emerge from the integrated analysis of quantitative and qualitative findings.

Competency development patterns

The significant improvements across all competency domains support the educational value of structured internship experiences, consistent with previous research highlighting experiential learning benefits in exercise science education (Reddan, 2016; Cereda, 2021). However, the varying magnitudes of improvement across different competency domains warrant consideration. The largest gains in practical skills application, professional communication, and client/athlete assessment suggest that internships particularly enhance competencies requiring authentic contextual application—precisely those aspects challenging to develop within classroom environments (Olson et al., 2018).

The relatively smaller improvements in theoretical knowledge, research application, and ethical reasoning may reflect the already substantial development of these domains through academic coursework prior to internships (Tariq, 2025). Alternatively, these patterns might indicate that typical internship experiences provide fewer opportunities for explicit engagement with theoretical concepts and research evidence than with practical skills. This interpretation aligns with student reports of experiencing theory-practice gaps during internships, suggesting potential opportunities for more deliberately integrating theoretical reflection within practical experiences.

The distinctive competency development patterns across different placement settings highlight the contextual specificity of professional learning (Odlin et al., 2022). These differences present both challenges and opportunities for curriculum design. The challenge lies in ensuring comprehensive competency development despite limited placement durations. The significant variations demonstrated in this study support arguments for diversified placement experiences to develop rounded professional capabilities. Simultaneously, the distinctive developmental signatures of

different settings provide empirical guidance for matching student learning needs with appropriate placement contexts.

Mentorship as central to internship quality

The prominence of mentorship quality in both quantitative and qualitative analyses reinforces its critical importance in professional education (Schary & Cardinal, 2016). The identified characteristics of effective mentorship—graduated responsibility, explicit reasoning, constructive feedback, and professional role modelling—align with previous research on clinical education in related health professions (Penman et al., 2024). However, the present findings extend this understanding by demonstrating how these mentorship practices influence specific competency domains in exercise science contexts.

Particularly noteworthy is the impact of explicit reasoning verbalisation by supervisors, which students identified as transformative for developing clinical and performance analysis competencies. This finding supports cognitive apprenticeship approaches to professional education, which emphasise making expert thinking visible to novices (Collins et al., 1991). Similarly, the graduated responsibility approach aligns with Vygotskian concepts of scaffolding within the zone of proximal development (Vygotsky, 1978), suggesting that effective supervision involves deliberately calibrating challenge levels to students' evolving capabilities.

The significant relationship between supervisor experience and student outcomes raises important considerations for internship programme coordination. While experienced professionals typically provide superior mentorship, reliance on highly experienced supervisors may limit placement availability. This tension suggests the potential value of supervisor development programmes to enhance mentorship capabilities across experience levels, potentially expanding the pool of quality placement opportunities (Cereda, 2023). Furthermore, the challenge extends beyond mere availability. The findings of this study, which highlight the importance of a supportive and caring supervisory environment, must be contextualised within the significant pressures facing both academic and professional practice. Recent research underscores how the performative demands of the 'neoliberal academy' can create a 'care-less' culture, making it increasingly difficult for supervisors to model the very professional values of care and kindness they are meant to instil (Fortune et al., 2024). Therefore, effective mentorship is not simply a matter of technique, but a conscious pedagogical act. It requires supervisors to move beyond simple instruction towards a form of 'relational pedagogy', where the act of caring is framed as a fundamental principle of professional and social justice, not just an interpersonal skill (Hanlon, 2024). This implies that supervisor development programmes should not only focus on supervision strategies but also equip mentors to navigate and counteract these broader systemic pressures.

The importance of academic-practice alignment

The findings reveal that the degree of alignment between students' academic preparation and the reality of professional practice is a significant determinant of learning effectiveness. Student reports of being unprepared for non-clinical responsibilities, such as the business aspects of managing a fitness facility, or the struggle to apply theoretical knowledge in dynamic, real-world contexts, highlight a persistent theory-practice gap. This challenge is well-documented in work-integrated learning literature (Jackson, 2018; Olson et al., 2018) and underscores the difficulty of simulating the complexity of professional environments entirely within the confines of a university curriculum.

The quantitative data supports this interpretation, as the perceived alignment between academic knowledge and practical demands significantly predicted competency development ($\beta=0.29$, $p<0.001$), especially in domains related to theoretical application. This suggests that when students perceive a clear connection between what they learned in the classroom and what they are asked to do during their internship, their ability to apply theoretical concepts is enhanced. Conversely, a

perceived disconnect can hinder learning and create confusion, as noted in the qualitative data regarding differing professional standards between academic and industry settings.

These results emphasise the need for educational programs to develop more robust bridges between theoretical learning and applied practice. This may involve not only curriculum design that explicitly maps academic content to professional competencies, as suggested by various accrediting bodies, but also pre-internship preparation that addresses the specific contextual demands students are likely to face. Furthermore, fostering a strong tripartite relationship, where university tutors and industry supervisors collaborate to help students navigate these alignment challenges, is crucial for transforming potential friction into a valuable learning experience (Silva et al., 2018).

Reflective practice and professional networking

The importance of structured reflection in transforming experience into learning echoes established principles of adult education (Kolb, 2015; Schön, 1987). However, the specific finding that comprehensive reflection related most strongly to improvements in evidence-based practice and clinical/performance analysis competencies extends the understanding of the role of reflection in professional development. This pattern suggests that reflection particularly enhances competencies requiring integration of theoretical knowledge with practical observations—precisely the theory-practice connection that students often find challenging (Trede et al., 2012).

The multiple reflection modalities identified as valuable—guided written reflection, peer dialogue, and supervisory discussions—highlight the multidimensional nature of effective reflective practice. Purposefully designed interventions, such as reflective workshops based on theoretical identity models, can provide a structured means to facilitate this process (Clanchy et al., 2022). This diversity supports Boud and Walker's (1998) contention that reflection encompasses both individual cognitive processes and social dialogue. The finding that peer reflection opportunities significantly enhanced learning extends previous research by highlighting the value of creating communities of practice among student cohorts despite their distribution across different placement settings (Wenger, 2000; Smith et al., 2022).

Perhaps most significantly, the findings demonstrate the contribution reflection makes to professional identity formation. Students' accounts of contemplating alignment between personal values and professional demands through reflective activities illustrate the transformative potential of internships as identity workspaces (Trede et al., 2012). This transformative process is precisely what the literature on threshold concepts describes. Foundational work identified 'caring' as a key threshold concept navigated during placements (Clouder, 2005), and recent empirical research confirms that the internship is the critical context where professional identities are reshaped as students grapple with such 'troublesome' new perspectives (Shelley & McCuaig, 2020). Students enter these workspaces with existing notions of their pre-professional identity, often strongly oriented towards practitioner roles in fields like exercise science (Clanchy et al., 2021), and the internship provides a space to test and refine this identity against professional demands. This dimension of internship learning extends beyond competency development to encompass the ontological aspects of becoming a professional, developing not only capabilities but also ways of being and seeing consistent with professional community membership (Dall'Alba, 2009).

Tripartite relationship dynamics

The analysis of tripartite relationships between students, university tutors, and industry supervisors reveals both structural features and interactional qualities that influence internship effectiveness. The quantitative link between communication frequency and student outcomes provides empirical support for prioritising regular interaction within these relationships (Silva et al., 2018). Additionally, the qualitative finding that technology-mediated communication enhanced collaboration suggests

promising directions for internship coordination in contemporary professional education contexts (Olivier et al., 2020).

The identification of role clarity as fundamental to effective collaboration echoes previous research highlighting boundary ambiguity as a common challenge in work-integrated learning (Olson et al., 2018). However, the present findings extend this understanding by demonstrating how explicit documentation of respective responsibilities creates the foundation for productive relationships. The complementary expertise model, wherein each stakeholder's distinctive contribution receives explicit recognition, represents a particularly promising approach to enhancing collaboration while mitigating potential tensions arising from differing perspectives. Indeed, such a supportive relational structure is vital for creating the psychologically safe environment required for students to navigate the troublesome knowledge inherent in their professional development (Shelley & McCuaig, 2020). When the tripartite relationship functions effectively, it fosters the kind of caring pedagogical environment that is not only conducive to learning but is itself a fundamental aspect of a healthy and effective educational experience (Kinchin, 2022).

The power dynamics within tripartite relationships emerged as particularly influential for student agency and learning. The finding that assessment responsibilities sometimes inhibited students' disclosure of uncertainties aligns with previous research on assessment impacts in professional education (Boud & Falchikov, 2006). This tension highlights the importance of creating psychological safety within supervisory relationships and potentially separating formative guidance from summative assessment responsibilities where possible (Watling & Ginsburg, 2019).

Finally, the concept of shared investment offers valuable insights for enhancing tripartite relationships. Recognising the bidirectional knowledge transfer between students and supervisors challenges traditional hierarchical models of professional education and aligns with contemporary perspectives on work-integrated learning as mutually beneficial for all stakeholders (Jackson, 2018). This perspective suggests that framing internships as collaborative learning opportunities rather than unidirectional training experiences may enhance engagement from all participants.

Practical implications

The findings from this study offer several practical implications for enhancing internship experiences within exercise and sports science education. These recommendations span four key areas: strategic curriculum design and student preparation, targeted supervision enhancement strategies, structured approaches to reflection, and robust assessment practices.

Curriculum design considerations

The demonstrated pattern of setting-specific competency development supports strategic approaches to internship placement selection and sequencing. Firstly, competency-based placement matching is strongly indicated as a means of enhancing learning efficiency. The analysis of variance (ANOVA) revealed that distinct placement settings yield significantly greater gains in specific competency domains. For example, students requiring strengthened clinical reasoning would benefit most from exercise post rehabilitation placements, given the substantial gains observed in clinical analysis within this setting. Conversely, individuals needing development in performance analysis might prioritise sports organisation settings, as this context produced the greatest growth in that domain. Aligning placement settings with a student's identified developmental needs, based on pre-internship assessment, represents a strategic optimisation of the learning environment.

Secondly, the adoption of sequential placement models is supported where curriculum structure allows. The highly contextualised nature of competency development, evidenced by the unique developmental signatures of each setting, suggests that single-setting experiences may not suffice for achieving comprehensive professional capability. Sequential placements across diverse settings could

therefore provide a more rounded competency development. For instance, an initial placement in an educational institution setting, which was shown to foster the greatest improvements in professional communication, could prepare students with essential interpersonal skills for a subsequent, more technically specialised setting, accelerating learning in the latter context.

Finally, pre-placement preparation is necessary to address the academic-practice alignment challenges identified in the qualitative findings. Targeted preparation immediately preceding internships can mitigate initial performance anxiety and accelerate the pace of learning. Specifically, skills workshops focusing on setting-specific technical requirements could bridge the immediate gap between theoretical knowledge and workplace demands. Furthermore, workshops focusing explicitly on pre-professional identity development may assist students in contextualising their learning and career goals, thereby transforming potential alignment friction into valuable developmental opportunities.

Supervision enhancement strategies

Given the critical importance of supervision quality, which emerged in both quantitative and qualitative analyses as the most influential factor in determining internship outcomes, several approaches could strengthen this aspect of the student experience. The finding that specific mentorship behaviours—particularly explicit reasoning verbalisation and the use of graduated responsibility—were transformative for student learning suggests a clear direction for supervisor development programmes. Structured training that moves beyond administrative procedures to focus on pedagogical strategies could enhance mentorship quality across all settings. Such programmes might incorporate exemplary supervision recordings and guided practice opportunities to help supervisors cultivate these high-impact behaviours.

Furthermore, the challenges related to role clarity and communication identified within the tripartite relationship highlight the need for structured supervision frameworks. The research indicated that ambiguity regarding expectations was a frequent source of tension. Developing clear frameworks that explicitly delineate the roles, responsibilities, and communication protocols for all stakeholders would address this directly. Such frameworks should specify communication frequency, documentation requirements, and problem-resolution procedures, creating the foundation for the productive relationships shown to be essential for success.

The concept of 'shared investment' also emerged as a powerful facilitator of effective tripartite relationships. To foster this sense of mutual benefit and acknowledge the significant time investment required for quality supervision, formal supervisor recognition is warranted. Recognising supervisors' contributions through mechanisms such as academic appointments (e.g., clinical faculty status), professional development opportunities, or other incentives would enhance engagement and formally validate their crucial role in the educational process. Finally, creating supervision communities would be an effective strategy for disseminating the best practices identified in this study. Establishing communities of practice among industry supervisors, supported by regular forums or digital platforms, could facilitate the sharing of effective strategies and mutual support, thereby elevate the overall quality of mentorship, and fostering a consistent, high-quality experience for students.

Reflection enhancement approaches

The significant contribution of reflection to learning, confirmed quantitatively by the strong correlation between reflective practice and competency gains, suggests several potential enhancements. The qualitative data revealed that students found value in multiple modalities, including written portfolios and facilitated discussions. This supports the provision of diverse reflection formats to accommodate different learning preferences and maximise engagement. Digital

platforms, in particular, could offer flexible and dynamic spaces for reflective practice alongside more traditional written portfolios.

Moreover, the effectiveness of guided reflection points towards the value of using structured reflection prompts. To deepen the quality of student analysis, these prompts could be designed to be developmentally appropriate, evolving throughout the placement. Initial prompts might focus on concrete experiences, guiding students to describe and analyse specific events. Later prompts could address more complex issues of theoretical integration and professional identity development, encouraging the kind of transformative learning described by students in the study.

The qualitative evidence also highlighted the profound impact of peer dialogue, with students describing their intern seminars as 'invaluable'. This finding strongly supports the creation of peer reflection communities. Structured opportunities for students to share experiences, even when placed in different settings, can enhance learning through exposure to diverse perspectives and foster a supportive community of practice. Digital platforms offer particular promise for connecting geographically distributed students for this purpose. Finally, to address the theory-practice gap that students identified as a central challenge, integrated theory-practice reflection should be explicitly encouraged. Prompts that require students to connect their practical observations with specific theoretical concepts from prior coursework can provide a scaffold for bridging this gap, making the link between academic knowledge and professional application more tangible.

Assessment considerations

The findings suggest several approaches to enhancing assessment practices to be more meaningful and consistent. To address the variation in expectations across different settings, developing a comprehensive, competency-based assessment framework is a primary recommendation. A behaviourally anchored framework, aligned with professional standards, would enhance assessment consistency while clarifying expectations for students, tutors, and supervisors alike.

The power dynamics inherent in the supervisor's dual role as mentor and evaluator were identified as a potential barrier to student learning. This suggests moving towards collaborative assessment processes. Assessment approaches that actively involve all three stakeholders in a structured dialogue can transform evaluation from a hierarchical judgment into a collaborative learning opportunity. Such a process enhances validity through the triangulation of perspectives and fosters the psychological safety needed for honest self-appraisal.

The positive impact of technology on communication within the tripartite relationship also has implications for assessment. The use of technology-enhanced assessment platforms could significantly improve the process. Digital platforms that facilitate the regular documentation of observations and feedback can enhance the comprehensiveness of assessment while reducing the administrative burden. As shown by the utility of online logs for communication, such platforms could provide a transparent, real-time record of student progress. Lastly, the finding that supervisor experience is a significant predictor of student outcomes suggests a need to support novice supervisors. Mapping developmental milestones for different competencies, based on the normative data generated in this study, could help calibrate expectations. Such mapping would provide a valuable tool for novice supervisors to identify students requiring additional support and to provide more targeted, developmentally appropriate feedback.

Limitations and future research

While providing valuable insights, this study contains several limitations that suggest directions for future research. These limitations primarily relate to the study's methodological design, including its single institution focus, the reliance on self-report measures, its examination of short-term outcomes, and the nature of the quantitative competency framework used.

Methodological limitations

The methodological limitations of this study should also be considered. Firstly, although it encompasses multiple placement settings and years, the study's concentration within one university programme limits generalisability; multi-institutional studies would strengthen the evidence base for effective internship practices. Secondly, the reliance on self-report competency assessments introduces potential bias, despite triangulation through supervisor and tutor ratings. Future research incorporating objective performance measures would enhance validity. Additionally, the study's emphasis on immediate post-internship outcomes precludes examination of long-term professional development impacts. Longitudinal studies tracking graduates' professional trajectories would provide valuable complementary evidence. Finally, the standardised competency framework, while enabling consistent measurement, may inadequately capture the complex, context-dependent nature of professional practice. Mixed-methods approaches incorporating practice observations would offer richer understanding. Furthermore, while the instrument underwent a rigorous content validation process, construct validity was not formally assessed using techniques such as confirmatory factor analysis; future studies could further strengthen the instrument's psychometric properties.

Future research directions

Building on this study, future research could explore several promising avenues. Firstly, experimental comparisons of different internship models (e.g., concentrated vs. distributed schedules; single vs. multiple settings) would provide stronger evidence for optimal programme design. Secondly, the systematic evaluation of supervisor development initiatives is needed to strengthen the evidence base for enhancing mentorship quality, incorporating both supervisor competency and student outcome measures. Furthermore, investigating the impact of technology-mediated supervision on learning outcomes and relationship quality would inform contemporary programme development. In-depth exploration of how specific internship experiences influence professional identity formation would also enhance understanding of this crucial developmental process. Additionally, examining the organisational factors that support sustainable, high-quality internship provision is essential for addressing practical implementation challenges. Finally, investigating how internship-developed competencies transfer to employment contexts and evolve throughout early career development would provide valuable insights for curriculum alignment with professional needs.

Conclusion

This comprehensive analysis of exercise and sports science internships demonstrates their substantial contribution to students' professional competency development. The significant improvements across all measured competency domains, with particularly pronounced gains in practical skills application, professional communication, and client/athlete assessment, affirm the educational value of structured workplace experiences. The distinctive competency development patterns observed across different placement settings highlight both the contextual specificity of professional learning and the potential value of diverse placement experiences.

Beyond quantifiable competency gains, the findings illuminate the complex processes through which internship experiences contribute to professional development. Quality mentorship, characterised by graduated responsibility, explicit reasoning, constructive feedback, and professional role modelling, emerged as the most influential factor determining internship effectiveness. Similarly, academic-practice alignment, structured reflective practice, and professional networking opportunities significantly enhanced learning outcomes. The tripartite relationship between students, university tutors, and industry supervisors constitutes the organisational foundation for effective internships, with communication patterns, role clarity, power dynamics, and shared investment emerging as critical dimensions of these relationships.

These findings offer evidence-based guidance for enhancing internship experiences within exercise and sports science education. Curriculum design strategies including competency-based placement matching, sequential placement models, and targeted pre-placement preparation could strengthen learning outcomes. Supervision enhancement through structured development programmes, explicit frameworks, appropriate recognition, and supervisor communities could address the critical mentorship dimension. Similarly, diverse and structured reflection opportunities could maximise the transformative potential of workplace experiences.

As the exercise and sports science profession continues to evolve and diversify, high-quality internship experiences represent crucial developmental opportunities for emerging professionals. By implementing evidence-based approaches to structuring, supporting, and assessing these experiences, educational programmes can enhance graduates' readiness for professional practice while strengthening connections between academic institutions and industry partners. Through such collaborative educational approaches, the exercise and sports science discipline can continue developing practitioners equipped to meet evolving professional demands across diverse contexts.

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Conflict of interest

The author hereby declares that this research is free from conflicts of interest with any party.

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Statement on the use of artificial language tools

No generative AI or large language model (LLM) has been used in the authorship or conceptual development of this work. As the author is not a native speaker of English, minor editorial refinements were made using AI-assisted tools strictly for the purposes of enhancing linguistic clarity, correcting grammar and punctuation, and improving stylistic coherence. Such interventions fall under the category of *AI-assisted copy editing* and did not entail the generation of original content. The author retains full responsibility for the content and attest that the final version accurately represents his intellectual contribution.

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