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Exploration of the clinical exercise physiologist standards in the UK: are they fit for purpose and how could they be developed?

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Registered clinical exercise physiologists (CEPs) are recognised healthcare professionals in the UK and are registered through the Academy of Healthcare Science (AHCS). Their practice is guided by the Clinical Exercise Physiology UK (CEP-UK) standards outlined in their scope of practice and the accompanying curriculum framework. This study aimed to explore the current CEP standards and understand if they are fit for purpose in the UK.
Three phases (1) a scoping review of Medline, Web of Science and Cumulative Index to Nursing and Allied Health Literature databases. A survey was phased (2) using a 1–5 rating Likert scale ranking the importance of each component for a UK CEP. Phase (3) consisted of two focus groups to gain a consensus on the current standards and recommendations for future iterations. Overall, academics (n=26), healthcare professionals (n=25), CEPs (n=10), service managers (n=6) and researchers (n=4) were identified through purposive sampling and snowball sampling. Phase (1) identified 24 studies containing relevant knowledge and skills. During phase (2), n=58 (82%) of participants completed the survey and n=25 (35%) attended focus groups in phase (3). All knowledge and skills identified from the scoping review, the CEP-UK scope of practice, curriculum framework and the AHCS standards of proficiency and good clinical practice (n=58) were accepted. For CEP practice, an additional three health conditions were accepted from the previous iteration into the current health condition categories. A knowledge and understanding of nine key health professions was also recommended. The final consensus identified that 58 key knowledge and skills across the current health condition categories were required by CEPs, meaning that the current CEP-UK curriculum framework is fit for purpose with only minimal changes required for the next iteration.

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INTRODUCTION

Recognition of clinical exercise physiologists (CEPs) or equivalent professions within different international healthcare systems is increasing, with countries such as Australia, New Zealand and the USA formally recognising CEPs as healthcare professionals within the public and private healthcare sectors.[1] In the UK, CEPs have been recognised as registered healthcare professionals since 2021.[1 2] CEPs possess specialist knowledge and skills in assessments of functional capacity, exercise prescription and delivery, and behaviour change theory and application.[2] The skills required by healthcare professionals, however, are continually evolving based on patient needs, technological advancements and the emergence of new evidence and treatments.[3] It is important for healthcare regulators, educators and professionals to regularly review and update the knowledge and skills required for effective clinical practice.[3] Ensuring that the roles and expertise of healthcare professions are clearly defined, that relevant workforces contain competent professionals, and that education curricula align with the knowledge and skills required of their relevant professions is an essential part of healthcare quality assurance.[4] Such practice is aimed at maintaining high standards of patient care across healthcare services.[5]

The creation of Clinical Exercise Physiology UK (CEP-UK) scope of practice and the development of the accompanying curriculum framework for Academy of Healthcare Science (AHCS) accredited Clinical Exercise Physiology master's (MSc) degrees formed the initial building blocks for CEP registration in the UK.[1 2 6] These documents, benchmarked on international standards with similar accreditation/registration requirements (eg, Australia), in combination with the AHCS standards of proficiency and good scientific practice, form the basis of the initial competency criteria for CEP registration.[1 2] In the UK, a scope of practice, degree curricula and standards of proficiency of healthcare professions should be regularly reviewed and developed every 5 years to ensure that they contain the latest knowledge, skills

and competencies to deliver safe and effective patient care and reflect current practice.[7 8] For the education and training of a registered CEP to reflect how clinical exercise services are delivered within the UK, an understanding of the knowledge and skills required to work effectively in the UK healthcare system was needed. A previous exploration regarding the perspectives of academics, CEPs and exercise rehabilitation service users was completed to understand their experiences of CEP knowledge and skillsets.[9] Stakeholders acknowledged that registered CEPs should be able to competently apply theoretical and practical knowledge and skills in areas such as pathophysiology, screening and risk assessment, exercise assessment, exercise design and delivery, and behaviour change implementation within clinical practice.[9] Further, clinical placements, acknowledged as essential within the curriculum framework for an accredited UK MSc CEP programme,[6] were recognised as fundamental for a successful transition into real-world, clinical practice.[9 10]

Despite previous findings, to date, there has been no formal review of the knowledge and skills contained within the CEP-UK scope of practice,[2] curriculum framework[6] or the AHCS documents in relation to CEPs.[11] Therefore, the aim of this study was to form part of this process and establish whether the current CEP standards and guidelines were fit for purpose by reaching a consensus on a complete, definitive list of the key knowledge and skills required by a registered CEP in the UK.

METHODS

Research design

This study used a mixed-methods research design involving three phases (1) a scoping review, (2) a modified Delphi survey and (3) focus groups. This design allows a final list of the key knowledge and skills of a CEP to be identified.

Phase 1: scoping review

The aim of the scoping review was to identify the key knowledge and skills of a CEP (or equivalent globally) from the current literature.[12] The reporting of the methods and results in this review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 extension for scoping reviews checklist.[12] The research question that formed the basis of this review was:

'What knowledge and skills does a CEP, or equivalent, need to work effectively in healthcare settings?'

Literature search

The search strategy identified all published research articles regarding the knowledge and skills of a CEP or equivalent (Accredited Exercise Physiologist, Certified Clinical Exercise Physiologist and Biokineticist), with search terms outlined within the scoping review process. The search was conducted electronically using Medline, Web of Science and Cumulative Index to Nursing and Allied Health Literature (CINAHL).

Inclusion and exclusion criteria

All qualitative, quantitative and mixed-method studies that reported knowledge and skills of a CEP were included. The inclusion criteria used were as follows:

- Published between January 1990 and present.
- English language.
- Peer-reviewed academic journal.
- Human studies.
- CEP or equivalent is used as a noun in title and/or abstract.
- Knowledge, skills or equivalent is used as a noun or verb in title and/or abstract.
- There is a focus on CEPs or equivalent in healthcare systems.
- There is sufficient focus on the knowledge and skills (or equivalent) of a CEP (or equivalent) in the article to contribute to the research question.

Eligibility of studies

Two reviewers (CO and AC) screened the titles and abstracts to remove those studies that fell outside the scope of the review. The full text manuscripts that met the inclusion criteria of the review were retained.

Data extraction

Data were extracted manually through reading the manuscripts and transferring the data onto a Microsoft Excel (Microsoft Corporation, 2021) spreadsheet by CO and reviewed by AC for validity.

Data analysis

Key knowledge and skills were extracted, analysed and allocated into relevant domains based on prominence in the manuscripts. Additionally, the health condition categories that a CEP should be able to work with and the healthcare professions that they should understand the roles and expertise of were assessed.

Phase 2: electronic survey

An electronic survey is an effective method to reach consensus between experts and practitioners[13 14] and is frequently used for exploring curricula within health science education.[15 16] This survey consisted of one round of questionnaires administered to relevant stakeholders around the topic of interest.[13 17–19]

Participants and recruitment

The stakeholders were identified using various recruitment strategies. This included purposive sampling by direct contact with academics identified from university websites and healthcare professionals identified through databases of exercise rehabilitation services across the UK,[20] public advertisement through social media and snowball sampling. The stakeholders included employers, commissioners, academics, CEPs and other health professionals across the UK. There is no set standard for the

sample size of participants for a survey, though it is generally agreed that larger samples increase the reliability of the responses of the whole panel.[21] Given the complexity of the questions within the survey and the number of different stakeholders that required an understanding of the CEP role in the UK, 50 or more participants were considered sufficient.[22] Using Microsoft Forms, a survey was created to obtain initial expressions of interest from stakeholders who were deemed eligible and wished to participate in the survey (online supplemental appendix A). Demographic information: name, email, occupation, current workplace setting, gender, ethnicity, years of experience in a clinical exercise-related role, whether they were AHCS registered or not, and whether they worked in the UK was collected via this survey and used to identify participants who were eligible.

Eligibility criteria

The participants included were those who fulfilled the following criteria:

- Work in the UK.
- Work or have had experience in a clinical exercise-related role.
- Work or have had experience as a healthcare professional within the field of clinical exercise.
- Work in or have had experience in an academic role within the field of clinical exercise.
- Work in or have had experience in a research role within the field of clinical exercise.

Protocol

An electronic survey was created containing the key knowledge and skills of a CEP identified from the following: the CEP-UK curriculum framework; the AHCS standards of proficiency; the scoping review (phase 1); and data from our previous study.[9] Each question had a Likert scale of 1–5, 1 being 'strongly disagree', 2 being 'disagree,' 3 being 'neither agree nor disagree,' 4 being 'agree' and 5 being 'strongly agree.' Participants rated each component based on their importance for a CEP and were given the opportunity to add any comments anonymously at the end of each section. The survey was piloted before release by CO. Data were collected over 10 weeks from August 2023 to October 2023 with weekly email reminders sent to participants. The number of respondents was recorded, and those participants that did not respond were not included in the review.[15 16] A 70% response rate from the pool of the expressions of interest was targeted to ensure suitable reach and engagement by the relevant stakeholders was generated.[23] The percentage of agreement was calculated for each question, and all anonymous comments were reviewed by the research team for discussion in phase (3). If a rating of 4–5 for any knowledge or skill was given by ≥80% of respondents with no relevant comments, they were retained. A rating of between 1 and 3 by ≤80% of respondents was identified as requiring further focus group discussion to understand participant reasoning.

Phase 3: focus groups

Participant recruitment

Participant recruitment was based on survey completion and an expression of willingness to participate in the following focus groups being provided.

Data collection

The focus group schedule (online supplemental appendix B) was developed based on the survey outcomes and topics for discussion (those scoring ≤80%). Pilot interviews were conducted by the first author (AC) with three independent research peers before focus group commencement to enhance credibility and refine interview questions where necessary.[24] Focus groups (n=2) were conducted by the first author (AC) via a secure virtual platform (Microsoft Teams) lasting 97 min on average (ranging from 70 min to 124 min). Written and verbal consent was obtained and focus groups were visually and audio recorded with prompts and probes used to elicit more detailed responses from participants.[25] A brief verbal summary was provided by the researcher at the end of the discussion to clarify the main points and allow participants to add further information (where required).[26]

Data analysis

Data obtained through the focus groups via participant observations were audio and visually recorded using a portable Dictaphone and Microsoft Teams, then transcribed verbatim. Data were thematically analysed manually using thematic analysis recommendations such as data familiarisation, generating initial themes, coding and finalising patterns of shared meanings underpinned by a central concept, and writing up using data extracts interspersed with researcher interpretations.[26] Descriptive thematic analysis was driven by both the prevalence (number of speakers articulating the theme) and the importance placed on information.[26] It is important to note that 'data saturation' or 'data adequacy' could be assumed as no new themes or content relating to specific questions were identified when analysing the transcripts.[27] Primary analysis was conducted by the first author (AC) with a debriefing session completed with the research team to discuss, challenge and reframe the thematic structure (where applicable).[28]

RESULTS

Phase 1: scoping review

1084 papers were identified from the initial database searches, which decreased to 792 papers after the duplicates were removed. After the titles and abstracts were screened, 763 papers were excluded as they were:

- not in English;
- not from a peer-reviewed academic journal;
- not a study on humans;
- did not use CEP or equivalent as a noun;
- did not use knowledge, skills or equivalent as a noun or verb;

- did not have a sufficient focus on CEPs, or equivalent in healthcare systems worldwide.

The remaining papers (n=26) were accessed and screened for inclusion eligibility. Research papers were excluded (n=11) due to insufficient focus on the knowledge and skills of a CEP (or equivalent). An additional set of papers (n=11) that did not appear in the initial literature search were identified via searching the reference lists of included papers and via suggestions from members of the research team. Full texts were retrieved and screened for eligibility, with exclusion (n=2) due to book chapter format. A final sample of papers (n=24) was included in the review. A PRISMA flow diagram[24] of the full identification process is outlined in figure 1 and a description of the included studies (n=24), including the type of article, methodologies, populations and country of study, is outlined in table 1. After data extraction, the knowledge and skills identified were categorised into the six key domains based on the CEP-UK MSc Clinical Exercise Physiology curriculum framework, the AHCS Standards of Proficiency and Good Scientific Practice (table 2). Additionally, health condition categories that a CEP should be able to work with and healthcare professions that a CEP should understand the roles and expertise of were identified and are also shown in table 2.

Phase 2: survey

Of the people who expressed interest in answering the survey (n=78), 91% (n=71) met the inclusion criteria. The reasons for exclusion included not working in the UK (n=4), being members of the CEP-UK steering group that created the curriculum framework and scope of practice (n=2) and not working as a clinical exercise professional (n=1). Of the eligible expressions of interest (n=71), 70% (n=50) responded to the survey. Table 3 outlines the demographic information of the survey participants.

Review of health condition categories

Respondents to the survey identified that CEPs should retain knowledge and skills to work with 15 overarching health condition categories (table 4). Six of the health condition categories (eating disorders, chronic pain, neoplastic (tumours and growths), immunological disorders, blood disorders and liver diseases) were identified from the scoping review and were not previously included in the CEP-UK scope of practice. The respondents' levels of agreement for each category identified that eight (53%) were accepted outright and seven (47%) were considered as needing further exploration based on percentages of agreement (ratings 4–5) ≤80%. Three categories (chronic pain, immunological disorders and liver diseases) not currently included in the current CEP-UK scope of practice were found to be required in future discussions.

Review of healthcare professions

Nine healthcare professions were identified from the scoping review (table 5). Respondents recognised that a

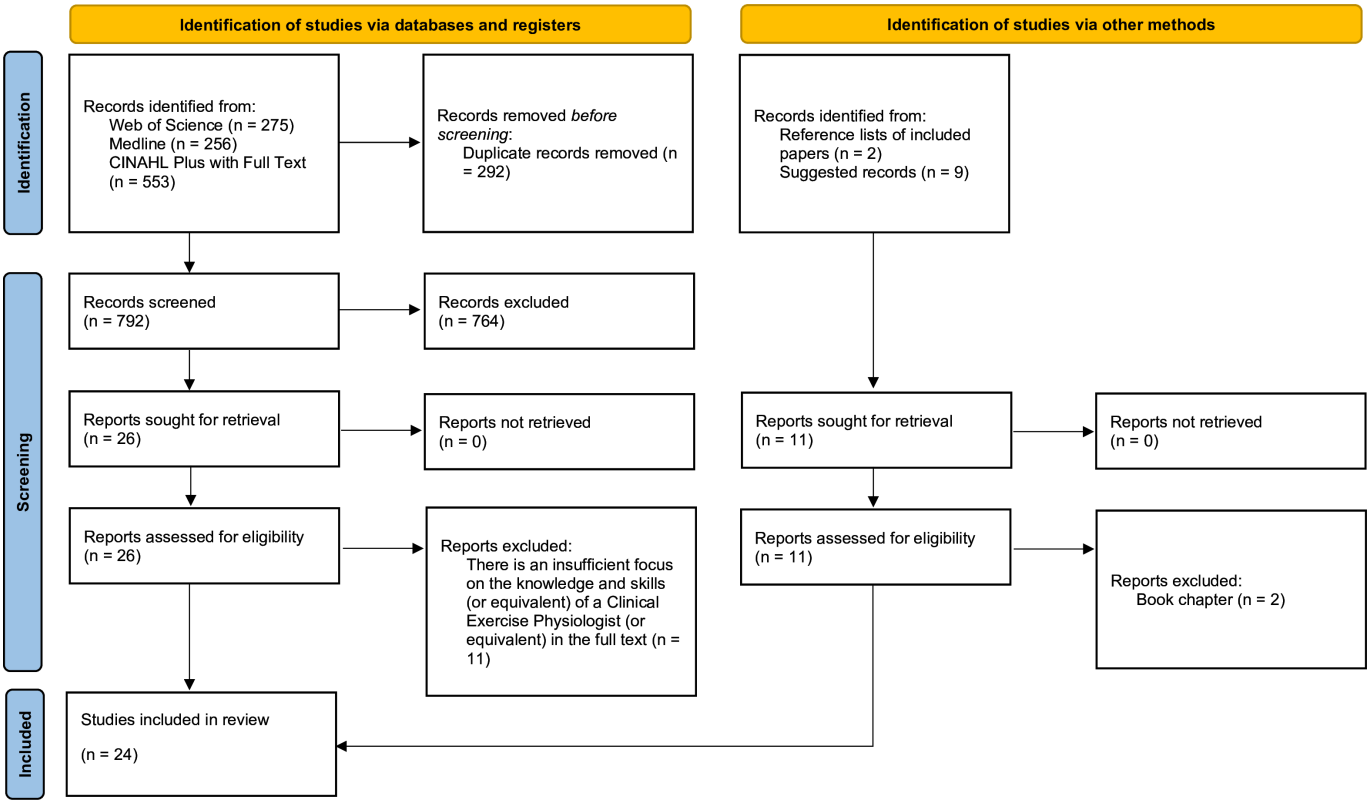

Figure 1 PRISMA flow diagram showing the identification of papers and the inclusion process. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.[45]

Table 1 Description of the included studies identified from the scoping review

Number	Author	Date	Title	Article type	Methodologies	Populations	Country
1	Bahl *et al.*[28]	2016	The development of a subjective assessment framework for individuals presenting for clinical exercise services: A Delphi study	Delphi Study	e-Delphi	CEPs	Australia
2	Bergmeier *et al.*[46]	2021	What role can accredited exercise physiologists play in the treatment of eating disorders? A descriptive study	Qualitative, Descriptive Study	Semistructured Interviews	AEPs	Australia
3	Berry *et al.*[47]	2020	The state of clinical exercise physiology in the United States	Review Article		CEPs	USA
4	Bridgman *et al.*[48]	2021	Piloting an interprofessional chronic pain management program: Perspectives of health students and community clients	Qualitative Study	Cross-sectional Survey	Students from healthcare Professions	Australia
5	Burger *et al.*[49]	2020	Ergonomic Principles as an Adjunct to the Profession of Biokinetics	Review Article		Biokineticists	South Africa
6	Cheema *et al.*[50]	2014	Exercise physiologists emerge as allied healthcare professionals in the era of non-communicable disease pandemics: a report from Australia, 2006–2012	Review Article		AEPs	Australia
7	Coletta *et al.* [51]	2020	Synergy Between Licensed Rehabilitation Professionals and Clinical Exercise Physiologists: Optimizing Patient Care for Cancer Rehabilitation	Review Article		Licensed rehabilitation professionals, CEPs	USA
8	Cooper *et al.*[52]	2022	Certified Exercise Physiologists Educated Leaders in Fitness and Beyond	Review Article		CEPs	USA
9	Davis *et al.*[53]	2001	California cardiac rehabilitation practitioners and their staff preparation preferences	Qualitative Study	Survey	Cardiac rehabilitation staff	USA
10	Fibbins *et al.*[54]	2019	Incorporating exercise professionals in mental health settings: An Australian perspective	Review Article		AEPs	Australia
11	Franklin *et al.*[55]	2009	Exercise physiologist's role in clinical practice	Review Article		CEPs	USA
12	Furness *et al.*[35]	2018	Adding an accredited exercise physiologist role to a new model of care at a secure extended care mental health service: a qualitative study	Qualitative, exploratory study	Semistructured interviews	Managers or senior clinical staff, allied health staff	Australia
13	Furzer *et al.*[56]	2021	Move your mind: embedding accredited exercise physiology services within a hospital-based mental health service	Feasibility Study		AEPs	Australia
14	Jones *et al.*[57]	2022	A survey evaluation comparing pain curriculum taught in Australian exercise physiology degrees to graduate perceptions of their preparedness and competency to treat people with chronic pain	Qualitative Study	Cross-sectional Survey	University exercise physiology course providers and exercise physiology graduates	Australia

Continued

Table 1 Continued

Number	Author	Date	Title	Article type	Methodologies	Populations	Country
15	Lederman *et al*.[58]	2016	Consensus statement on the role of Accredited Exercise Physiologists within the treatment of mental disorders: a guide for mental health professionals	Qualitative Study	e-Delphi	AEPs and mental health professionals	Australia
16	McKeon *et al*.[59]	2023	A qualitative exploration of the experience and attitudes of exercise professionals using telehealth for people with mental illness	Qualitative Study	Semi-structured Interviews	Exercise physiologists	Australia
17	Overstreet *et al*.[60]	2023	Technical Requirements for Clinical Exercise Physiologists as Qualified Health Professionals	Statement		CEPs	USA
18	Pearce *et al*.[61]	2021	The Role of the Clinical Exercise Physiologist in Reducing the Burden of Chronic Disease in New Zealand	Review Article		CEPs	New Zealand
19	Ram *et al*.[62]	2020	Exercise and education for knee osteoarthritis—What are accredited exercise physiologists providing?	Qualitative Study	Cross-sectional Survey	AEPs	Australia
20	Raymond *et al*.[63]	2020	Development of Core Clinical Learning Competencies for Australian Exercise Physiology Students	Mixed-methods, multiphase study	Surveys and Focus Groups	AEPs, university academics and university clinical/ practicum co-ordinators	Australia
21	Santa-Mina *et al*.[64]	2013	The Evolving Role and Clinical Application of the Exercise Physiologist	Review Article		Researching exercise physiologists	Canada
22	Smart *et al*.[65]	2016	The Role and Scope of Accredited Exercise Physiologists in the Australian Healthcare System	Review Article		AEPs	Australia
23	Soan *et al*.[66]	2014	Exercise physiologists: essential players in interdisciplinary teams for noncommunicable chronic disease management	Review Article		AEPs	Australia
24	Stanton *et al*.[67]	2018	Implementation in action: how Australian Exercise Physiologists approach exercise prescription for people with mental illness	Qualitative Study	Cross-sectional Online Survey	AEPs	Australia

AEPs, accredited exercise physiologists; CEPs, clinical exercise physiologists.

knowledge and understanding across 89% of professions were required outright within future standards, with one role (podiatry) requiring further discussion.

Review of knowledge and skills

The respondents' levels of agreement for each knowledge and skill domain are outlined in table 6. Of the knowledge and skills that were rated in the survey (n=58), 100% were accepted outright. There were no new knowledge or skills identified by the survey that were not previously included in the curriculum framework, scope of practice or standards of proficiency. However, further discussions were undertaken in the focus groups to clarify these findings.

Phase 3: focus groups

The final sample (n=25) included academics (n=18), AHCS registered CEPs (n=6) and non-registered exercise specialists (n=1). Participants were white British, female (n=8) and male (n=13), black male (n=1), Latin American male (n=1), Asian or Asian British female (n=1) and Mixed White and North African female (n=1). All participants had previously completed the electronic survey.

Overview of discussions

The primary aim of the focus group discussions was to review the lower scoring (≤80%) exercise conditions and the relevance of podiatry knowledge to the CEP role. Four conditions were accepted, one of which currently featured in the CEP-UK scope of practice (renal conditions):

> If GPs were aware CEPs could safely handle complexity in conditions such as chronic kidney disease, referrals would rise immediately…it also plays a massive part

Table 2 The key domains, knowledge and skills; health condition categories and healthcare professions identified from the scoping review

Key domains: knowledge and skills	Health condition categories identified that CEPs or equivalent should be able to work with	Healthcare professions identified that CEPs or equivalent should understand the role and expertise of
Pathophysiology and clinical management Knowledge and understanding of: ► Human anatomy and physiology[2 6 50–52 55] ► The pathophysiology of various clinical conditions[2 6 50–52] ► The biomechanics of apparently healthy individuals, and those with clinical conditions[2 6 50–52] ► The impact of various clinical conditions on the acute and chronic responses to exercise[2 6 55] ► The impact of acute and chronic exercise training on the physiological mechanisms within healthy individuals, and those with chronic diseases[2 6 55] ► Common pharmacological and non-pharmacological methods for treating and managing various clinical conditions[2 6 55] ► The roles of other members of a multidisciplinary team[2 6] ► Ensuring a safe exercise environment[2 6] Skills and abilities in: ► Working safely and effectively within a multidisciplinary team, independently or under supervision in a variety of clinical settings[2 6] ► Communicating effectively with patients and other members of the team[2 6] Screening and risk stratification Knowledge and understanding of: ► Relative and absolute contraindications to exercise testing and participation[2 6 24 50–52 55] Skills and abilities to: ► Screen, risk stratify and apply clinical reasoning to ensure safety and appropriateness of exercise and physical activity interventions for patients[2 6 28 50–52 55 64 65] Assessment of health status and functional capacity Knowledge and understanding of: ► Suitable assessments for various clinical conditions and comorbidities[2 6 28 50–52 55 64 65] Skills and abilities in: ► Interpreting assessment data to guide clinical judgements that ensure safe and effective exercise prescription for patients[2 6 28 50–52 55 64 65] ► Evaluating acute and chronic responses to exercise[2 6 28] ► Evaluating a client's physical work capacity through the safe use of physiological tests during exercise, and at rest[2 6 28] ► Effectively communicating exercise physiology data and management plans orally, and in written form[2 6 28] Design of exercise interventions Skills and abilities to: ► Design and prescribe safe, effective and individualised exercise interventions for the treatment, prevention or management of pathological conditions[2 6] ► use assessment results and personal goals to help inform exercise prescription[2 6 50–52 55 64 65] ► Periodically reassess exercise programme efficacy[2 6] ► Integrate pathophysiology into exercise prescription[2 6] Exercise delivery and implementation Skills and abilities to: ► Deliver individualised exercise interventions for the treatment, prevention or management of individuals with pathological conditions[2 6 50–52 55 64 65] ► Deliver one-to-one and group exercise classes face-to-face, or via telehealth services[2 6 50–52 55 64 65] Behaviour change and communication Knowledge and understanding of: ► Evidence-based guidelines for behaviour change interventions[2 6 50–52 55 64 65] ► Psychological and lifestyle factors that impact participation and responses to exercise and physical activity[2 6 55] ► Barriers to maintaining exercise compliance[2 6] Skills and abilities in: ► Prescribing and delivering individualised behaviour change interventions[2 6 35 55 56 58 64 65 67] ► Incorporating behaviour change techniques into rehabilitation programmes[2 6 35 55 56 58 64 65 67] ► Applying health education, advice and support mechanisms to enhance health and well-being, and promote participation and long-term adherence to exercise and physical activity using one-to-one and group counselling[2 6 35 55 56 58 64 65 67] ► Integrating lifestyle modification strategies within exercise prescriptions[2 6] ► Addressing barriers to maintaining exercise compliance[2 6 35 56 58 67] ► Conducting reflective practice[2 6]	► Cardiovascular diseases[2 6] ► Pulmonary/respiratory diseases[2 6] ► Metabolic conditions[2 6] ► Orthopaedic/musculoskeletal Conditions[2 6 57] ► Cancers[2 6] ► Mental health[2 6 49–52 54 55 62] ► Neurological/neuromuscular conditions[2 6] ► Eating disorders[25] ► Frailty[2 6] ► Chronic pain[53 68] ► Endocrine conditions[2 6] ► Neoplastic (tumours and growths)[51 64] ► Immunological disorders[51 64] ► Blood disorders[64] ► Liver diseases[64]	Physiotherapists[2 6 66] Clinical nurse specialists[2 6 66] Occupational therapists[2 6 66] General practitioners[2 6 66] Clinical psychologists[2 6 35 54–56 58 59 66 67] Podiatrists[2 6] Dietitians[2 6 66] Consultants[2 6 66] Specialist exercise instructors[2 6]

CEPs, clinical exercise physiologists.

Table 3 The electronic survey participant demographic information

Stakeholder	Gender	Ethnicity	Years of experience in a clinical exercise-related job role	AHCS registered	Work in the UK
Academics (n=23) Registered CEPs working in clinical practice (n=9) Exercise specialists (including non-registered CEPs as job title) (n=14) Directors (n=1) Head of policy for a professional body (n=1) Project officer (n=1) Cardiac technician (n=1)	Male (n=30) Female (n=20)	White (n=44) Black, Black British, Caribbean or African (n=2) Mixed White and North African (n=1) Latin American (n=1) Asian or Asian British (n=1) Unspecified (n=1)	0–5 years (n=14) 6–10 years (n=10) 11–15 years (n=7) 16–20 years (n=12) 21+years (n=7)	Yes (n=18) No (n=32)	Yes (n=50)

AHCS, Academy of Healthcare Science; CEPs, clinical exercise physiologists.

in diabetes awareness via nephropathy and the associated treatment pathways (Participant 12)

A similar view was evident during discussions around liver disease, more specifically the opportunity for exercise services to be provided in areas that currently lack provision and links to ongoing metabolic conditions:

> Exercise is one of the most powerful interventions we have for liver disease, but we rarely see referrals for liver conditions…often people don't understand how it (exercise) can improve conditions such as fatty liver disease, or even associated conditions such as hypertension, cholesterol and diabetes. It would be good to include and raise CEP knowledge levels (Participant 4)

Although immunological disorder content was identified as being important, it was felt that this content could potentially be included in the cancer landscape within courses, and therefore might not need outright reference in the scope of practice or curriculum framework, but rather feature within an existing health category:

> Immune-compromised patients need reassurance and expertise when exercising, not just a GP leaflet…I don't think people know who they should refer (those patients) to for the best, having it in writing might help with that (Participant 9)

Similarly, chronic pain was cited as appearing in various conditions, primarily as a co-morbidity, such as musculoskeletal, cancer and neurological disorders, yet there was a lack of acknowledgement of the condition itself, which was felt important in student understanding when considering the behavioural management of pain, including prescription medication considerations. The only healthcare profession

Table 4 The percentages of agreement and finalised list of health condition categories as rated by respondents

Health condition categories	Percentage of agreement (ratings 4–5)	Keep/discuss
Cardiovascular diseases	100%	Keep
Pulmonary/respiratory diseases	100%	Keep
Metabolic conditions	94%	Keep
Orthopaedic/musculoskeletal conditions	96%	Keep
Cancers	91%	Keep
Mental health	83%	Keep
Neurological/neuromuscular conditions	91%	Keep
Eating disorders	54%	Discuss
Frailty	96%	Keep
Chronic pain	76%	Discuss
Neoplastic (tumours and growths)	56%	Discuss
Renal diseases	76%	Discuss
Immunological disorders	67%	Discuss
Blood disorders	61%	Discuss
Liver diseases	67%	Discuss

Table 5 A list of healthcare professions requiring CEP understanding as rated by respondents

Healthcare professions	Percentage of agreement (ratings 4–5)	Keep/discuss
Physiotherapists	98%	Keep
Clinical nurse specialists	92%	Keep
Occupational therapists	94%	Keep
General practitioners	88%	Keep
Clinical psychologists	86%	Keep
Podiatrists	73%	Discuss
Dietitians	92%	Keep
Consultants	92%	Keep
Specialist exercise instructors	100%	Keep

CEP, clinical exercise physiologist.

Table 6 The finalised list of each knowledge and skill for a registered CEP in the UK as rated by respondents

Key knowledge and skills	Percentage of agreement (ratings 4–5)
Pathophysiology and clinical management	
Knowledge of human anatomy and integrative systems physiology;	100%
Knowledge of the pathophysiological bases for all conditions in the scope of practice;	96%
Ability to identify risk factors, signs and symptoms, and common comorbidities and how pathology might impact on activity of daily living for all conditions;	100%
Knowledge of common diagnostic procedures and criteria for all conditions;	90%
Ability to explain the purpose, rationale and clinical outcomes of typical therapeutic interventions for all conditions, including common surgical, medical (pharmacological and non-pharmacological) and allied health treatments;	88%
Ability to describe the impact of conditions on the physiological responses to common forms of exercise, including aerobic exercise, resistance exercise, flexibility and activities of daily living;	100%
Knowledge of, and ability to consider the effect of, surgical, medical and pharmacological treatments on exercise capacity and the physiological responses to exercise;	100%
Knowledge of, and ability to describe adaptations to exercise training, and how these are modulated by conditions and common treatments;	100%
Knowledge and understanding of the biomechanics of apparently healthy individuals, and those with clinical conditions;	84%
Screening and risk stratification	
Knowledge of relevant screening techniques and risk stratification processes;	100%
Ability to obtain relevant health information from a medical history, including social and cultural determinants of health;	96%
Ability to ascertain individual goals and aspirations, preferences, barriers and facilitators to design interventions that optimise concordance and outcomes either to reduce the risk of relapse or identify social and psychological risks that can mitigate concordance to a healthy active lifestyle;	100%
Ability to identify contraindications and risks for exercise and activities of daily living for all conditions and to assess and stratify exercise-related risk using evidence-based tools;	96%
Ability to select and employ appropriate strategies and measurements to assess and manage clinical status before, during and after exercise;	100%
Ability to record, report and appropriately respond to changes in risk factors and adverse signs and symptoms that may arise before, during and after exercise;	88%
Ability to interpret information for the purpose of establishing clinical risk, including when needs are outside scope of practice;	100%
Ability to take appropriate action to refer to other health professionals (eg, physiotherapist, dietitian, consultant);	100%
Assessment of health status and functional capacity	
Knowledge of a broad range of evidence-based measurements (eg, cardiorespiratory fitness, joint range of motion, spirometry, ECG) and patient reported outcome measures (eg, rate of perceived exertion, dyspnoea, physical activity) for the assessment of clinical and functional status for all conditions;	98%
Ability to select and safely administer appropriate measurements to assess physiological function and health status;	98%
Ability to safely interpret assessments to establish a baseline or ongoing health status as part of the planning of exercise interventions;	100%
Ability to record and evaluate the results of assessments of clinical status and functional capacity and to communicate the outcomes and relevance to patients and other healthcare providers;	100%
Ability to assess individual goals, needs and objectives based on health and exercise history, motivation level and physical activity readiness;	100%
Ability to communicate appropriate support strategies to facilitate in-person and telehealth service delivery, which considers needs, preferences, health and digital literacy and accessibility factors;	100%
Ability to safely conduct functional capacity assessments (eg, cardiopulmonary exercise test, 6 min walk test, resting ECG, resting blood pressure);	100%
Design of exercise interventions	
Knowledge and ability to explain optimal modes, frequencies, intensities, durations and volumes of acute and chronic exercise for all conditions;	100%
Ability to design evidence-based exercise plans that are safe, effective and consider treatment goals;	100%
Ability to consider environmental, medical history, clinical status and physiological assessment information and take psychological, social and cultural needs into consideration;	100%

Continued

Table 6 Continued

Key knowledge and skills	Percentage of agreement (ratings 4–5)
Ability to recognise the risks and benefits of exercise training for all conditions including aerobic, resistance, balance and flexibility exercise training;	100%
Knowledge of and ability to design appropriate regressions and progressions for individual exercises and/or adapt an exercise where necessary for specific conditions;	100%
Knowledge of best practice and condition specific exercise and nutrition guidance and resources based on available scientific evidence;	88%
Knowledge and ability of how to incorporate other activities of daily living into the overall weekly dose of PA including breaking up sedentary behaviour;	100%
Exercise delivery and implementation	
Ability to deliver safe and effective exercise sessions, adapted for individual and exercise environment needs (eg, home, virtual, workplace etc);	100%
Ability to lead individuals with single or multiple conditions and comorbidities in exercise programmes;	96%
Knowledge of, and ability to evaluate, contraindications to exercise and associated risks/benefits including the ability to modify or cease the exercise programme where necessary;	100%
Ability to identify and monitor adverse signs and symptoms during an exercise session and recovery, and take appropriate action where necessary;	100%
Ability to monitor and evaluate the outcomes of exercise interventions;	100%
Ability to monitor patients during exercise sessions using various methods (eg, heart rate, rate of perceived exertion, talk test);	100%
Ability to teach patients how to perform their prescribed exercises with correct technique for them to be able to exercise with minimal supervision;	100%
Behaviour change and communication	
Knowledge of barriers and motivators to exercise (eg, capability, opportunity, motivation) and of living with health conditions (eg, pain, anxiety, depression, bereavement), including influence of wider sociocultural factors (eg, ethnicity, gender, deprivation);	96%
Knowledge of the evidence-based biological, psychological, social mechanisms through which exercise impacts mental health and well-being;	94%
Ability to promote a healthy relationship with exercise and understand how to recognise, support and signpost in case of concerns (eg, compulsive exercise);	98%
Ability to understand contemporary evidence-based theories of behaviour change (eg, Self Determination Theory, Social Cognitive Theory, Affective-Reflective Theory) and implement these to inform approaches to support behaviour change;	86%
Ability to apply basic evidence-based, client-centred exercise counselling/coaching skills to understand goals, confidence, motivation, thereby effectively promoting exercise initiation and adherence (eg, motivational interviewing);	94%
Knowledge of behaviour change technique taxonomies and ability to select and apply evidence-based techniques in practice to promote self-regulation of long-term exercise behaviour (eg, barrier identification, action planning, self-monitoring);	94%
Ability to consistently engage in reflective practice with the understanding of and use of reflective models;	88%
Ability to co-produce with the client/patient meaningful longer-term goals, beyond the weeks of focused/structured exercise, that lead to an enhanced quality of life, which includes sustainable levels of health-related physical activity (eg, at home, workplace, part of transport etc);	96%
Clinical practice	
Be able to practise within the legal and ethical boundaries of the profession;	100%
Be able to maintain fitness to practise;	100%
Be able to practise as an autonomous professional, exercising their own professional judgement;	100%
Be aware of the impact of culture, equality and diversity on practice;	100%
Be able to practise in a non-discriminatory manner;	100%
Understand the importance of and be able to maintain confidentiality;	100%
Be able to work appropriately with others;	100%
Be able to maintain records appropriately;	96%
Be able to reflect on and review practice;	100%
Be able to assure the quality of their practice;	100%

Continued

Table 6 Continued

Key knowledge and skills	Percentage of agreement (ratings 4–5)
Understand the need to establish and maintain a safe practice environment;	100%
Be able to work independently, or under supervision, within a wide range of settings (eg, primary care, secondary care, private healthcare, community healthcare);	100%

CEP, clinical exercise physiologist; PA, physical activity.

not meeting consensus in the survey was Podiatry, yet on further exploration the participants recognised that CEPs required an awareness of how this profession could assist in the safety of patients for exercise and infection prevention:

> We need students to be aware of preventable outcomes in conditions such as diabetes, things like amputations… exercise and foot care work closely, managing diabetes for instance, isn't just about medication, movement prevents complication and footcare, therefore podiatry, helps us regarding safety. (Participant 15).

Conversely, neoplastic, blood and eating disorders were not felt to fall into the remit of a CEP as explicit health categories due to other specialists being more qualified (eg, dietitian for eating disorders) or were recognised as being closely linked to other conditions and content that featured in the documents already (eg, blood disorders and cancer).

DISCUSSION

This study used a combination of a scoping review, electronic survey and focus groups to establish whether the current CEP standards and guidelines were fit for purpose by reaching a consensus on a complete, definitive list of the key knowledge and skills required by a registered CEP in the UK. The respondents to the survey consisted of a variety of different stakeholders with a wide range of clinical exercise experience and expertise. An overall agreement level of 98% was identified across CEP knowledge and skill requirements; however, one domain (behaviour change and communication) dropped to 93% and had no content that had 100% agreement. Although still accepted, within the section behaviour change and communication, the criteria labelled 'understanding contemporary evidence-based theories of behaviour change' were somewhat less valued skills for a CEP compared with others. Interestingly, behaviour change implementation within clinical services has previously been identified as unstandardised and without a clear strategy for its delivery by registered CEPs.[29] Previous research[30] acknowledges that a service-wide multidisciplinary team (MDT) approach to behaviour change is optimal. Therefore, CEPs, as part of an MDT, should be sufficiently skilled to contribute in this area and support patients with an empathetic, empowering and autonomous approach, given the evidence of positive long-term behaviour change of patients once skills are mastered by staff.[31 32] It cannot be underestimated how important it is for such skills (theoretically learnt in an academic setting) to be developed through real-life application,[33] yet less emphasis was placed on these skills compared with exercise-based content by respondents, even though more recent evidence suggests it is an area of competence that is lacking across healthcare professionals (and possibly the expert group) as a whole.[34]

The highest levels of agreement came in the areas of 'exercise design and delivery', 'clinical practice' and 'assessment of health status and functional capacity' (98%, 99% and 99%, respectively). The ability to prescribe safe and effective exercise, in combination with the skills and competence to deliver the information in a technically correct manner to patients, has previously been identified as fundamental to the role of a CEP.[35 36] In parallel, high levels of knowledge and skills in clinical practice, for example legal and ethical professional boundaries, record keeping and quality assurance, have been acknowledged as underpinning the role of CEPs.[9] Further, the understanding of current health status, specifically the use of clinical assessments such as cardiopulmonary exercise tests, was acknowledged as essential in underpinning the exercise prescription requirements for a patient. The unequivocal nature of agreement within these domains also supports previous research that clinical practice as an overarching concept alongside the exposure to real-world mentoring and learning through placements is essential across CEP training.[29] The lowest individual set of criteria accepted by respondents was CEPs requiring 'a knowledge and understanding of biomechanics' with an 84% agreement. This criterion forms part of the foundational knowledge within the professional standards of CEPs or equivalent in other countries (eg, Australia and Canada),[37] with an understanding of the movement systems of the human body seen as valuable in the treatment, management and prevention of individuals with clinical conditions.[38] Moreover, biomechanics knowledge can be utilised when designing exercise programmes to ensure that patients are prescribed evidence-based exercises that consider their individual physical limitations.[39] Again, this criterion was accepted by respondents, but in the UK, this level of knowledge is frequently seen within undergraduate sport and exercise science courses and therefore, it could be assumed that this was a potential reason for it not being as highly valued by this stakeholder group.

Renal conditions, such as chronic kidney disease, listed within the current scope of practice scored 76% acceptance in the survey, yet focus group participants identified the need to retain this condition. Multimorbidity is a common feature in patients with renal conditions, with prevalence

in cardiovascular disease, diabetes and frailty frequently observed.[39] Acknowledgement that exercise was underutilised in renal conditions was apparent, providing future service development opportunities if CEPs were qualified. Chronic pain, a leading cause of global disability,[40] was the highest scoring condition in the survey not previously featured within the CEP-UK scope of practice and identified by respondents as a requirement. Although chronic pain is a specific disease, it is frequently cited as a comorbidity in several clinical conditions (eg, musculoskeletal and cancer); therefore, it could be considered for inclusion within an umbrella category, for example musculoskeletal conditions, in the prescription and design of exercise interventions.[41 42] Liver disease has evidence to suggest that exercise is beneficial[42] and was therefore recognised as required for CEP understanding due to a lack of exercise provision in this area. Although a specific condition, liver disease is often linked to metabolic disorders and therefore could be incorporated into that overarching health condition category within the scope of practice due to the probable overlap in content coverage and delivery during training. Additionally, immunological disorders have been linked to a broad spectrum of conditions identified as essential for CEPs, notably within a cancer remit,[43] and were therefore accepted by respondents to ensure sufficient coverage of these areas within the cancer category. Rather than expanding the existing and extensive list of health condition categories, adding these conditions as 'subgroups' into similarly aligned categories for the next iteration of the CEP-UK curriculum standards is recommended based on this consensus evidence.

Three health conditions (eating disorders, neoplastic (tumours and growths) and blood disorders) were not accepted by the respondents. Neoplastic, blood disorders and cancer conditions were highlighted as 'being very similar' by respondents and therefore no explicit inclusion was identified with previous literature recognising that neoplasms, like all other abnormal growths, can be either benign or cancerous.[43] Despite evidence identifying the benefits of exercise in treating individuals with eating disorders and a recent study in Australia by Bergmeier and colleagues[44] that identified AEPs as possessing the expertise to play a key role in treating patients with eating disorders, inclusion of this condition was rejected potentially due to a lack of research into exercise interventions across this population and a lack of CEPs in tertiary eating disorder clinics in the UK.[44] Interestingly, although a knowledge of stroke is identified in the current CEP-UK curriculum framework and scope of practice,[2 6] it was felt that a more specific outline of the knowledge and skills required for real-world practice in this area could be adopted to ensure that graduate CEPs were sufficiently educated on entering a role within this field, with this being a potential reason for the lack of CEP employment in this area currently in the UK.[20] It was identified that CEPs should work closely with all nine professions outlined in the survey. Akin to clinical practice being an overarching theme in previous research,[9] stakeholders acknowledged that interprofessional education, where knowledge, skills, ideas and values are shared between different healthcare professions, can help enhance CEP skillsets,[29 30] therefore improving the quality of patient-centred care and justifying inclusion.

Strengths and limitations

A PRISMA scoping review was completed in this study and used to inform the electronic survey. The respondents to the survey consisted of academics, CEPs and relevant healthcare professionals who have all had experience in the delivery of clinical exercise provision. Due to clinical exercise physiology being a new, emerging profession within the UK, most of the respondents were working within, or were highly interested in the field which introduced potential selection bias. However, the sample size was identified as sufficient given the infancy of healthcare registration in the profession with the high response rate demonstrating good internal validity.[22]

CONCLUSIONS

This study was the first formal review of the knowledge and skills contained within the CEP-UK scope of practice, curriculum framework and the AHCS standards of proficiency and good clinical practice. A consensus was obtained from key stakeholders with relevant qualifications and experience in clinical exercise physiology in the UK on a complete, definitive list of the key knowledge and skills required by a UK CEP, including the conditions and professions they should understand as part of their registration process. Based on these findings, the current CEP-UK curriculum framework could be further developed to include a broader range of health conditions within the existing health condition categories; however, the original iteration is recognised as requiring only minimal changes on formal review by CEP-UK in early 2026.

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Ethics approval This study involves human participants and ethical approval was obtained from Liverpool John Moores University Research Ethics Committee (ref: 22/SPS/009). Participants gave informed consent to participate in the study before taking part.

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