

# Development of Core Clinical Learning Competencies for Australian Exercise Physiology Students

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## ABSTRACT

**Background:** Clinical placements and assessment are an essential part of education to become a health professional. However, quality assessment in a clinical environment is challenging without a clear representation of what constitutes competence. The aim of this study was to establish core clinical learning competencies for Australian exercise physiology students.

**Methods:** This study used a mixed-methods, multiphase approach. The competencies were developed following electronic surveys and focus groups, with additional refinement provided by the project team. Preliminary validation was conducted via electronic survey where (i) participants rated the importance of each unit of competency for entry-level practice, and (ii) participants who had recently graduated ( $n = 23$ ) rated the extent to which they perceived they were competent in each unit.

**Results:** The competencies are described as 19 elements organized into 6 units. The units are (i) communication, (ii) professionalism, (iii) assessment and interpretation, (iv) planning and delivery of an exercise and/or physical activity intervention, (v) lifestyle modification, and (vi) risk management. Of 126 survey participants, the majority (93%–98%) considered each unit as being important for entry-level practice. The majority (78%–95%) of recent graduates considered themselves competent in each unit, suggesting the competencies are articulated around the level of a new practitioner.

**Conclusion:** The core clinical learning competencies resulted from an extensive, iterative process involving those with expertise in the area. The competencies have a range of applications, including informing the development of a student placement assessment tool for use in a clinical placement environment. *Journal of Clinical Exercise Physiology*. 2020;9(1):1–9.

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## INTRODUCTION

Exercise and physical activity are a key part of promoting health and well-being in the face of an aging population increasingly burdened with chronic disease (1,2). Accredited exercise physiologists (AEPs) are Australian allied health professionals with expertise in the design and application of

individualized exercise-based interventions for primary, secondary, and tertiary prevention and management of chronic disease or injury. The profession, although emerging (3), has developed from strong foundational epidemiological and experimental evidence, demonstrating the benefits of exercise and physical activity for the prevention and

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management of a wide range of conditions, including, but not limited to, cardiovascular disease, diabetes, and mental illness (2). University graduates are eligible for accreditation as an AEP with Exercise and Sport Science Australia (ESSA) upon completion of an ESSA-accredited program of study in clinical exercise physiology (EP). Importantly, and as is the case with other allied health professions in Australia, EP students must be ready for autonomous practice upon graduation as there are no mandatory requirements around supervised practice once accredited. Therefore, accreditation is essential for establishing the quality of educational programs and for ensuring graduates are able to provide safe and effective care for their clients (4).

As part of the accreditation requirements for programs preparing students to become AEPs, the higher education provider must demonstrate that its graduates possess the requisite knowledge and skills that are articulated in both the Exercise Science Standards (5) and AEP Professional Standards<sup>1</sup> (6). Graduates are also required to have completed at least 360 clinical placement hours and be assessed as competent by a qualified supervisor. However, the competencies that a student must attain to be deemed competent by the completion of these clinical placement hours have not been formalized. Thus, interpretation of what constitutes a clinically competent student at the completion of his or her clinical placement hours may vary nationally. Furthermore, while the standards (6) provide clarity for key areas such as designing safe and effective exercise plans, other potentially important competencies such as communication and professionalism are less well defined and, as such, challenging to translate into an assessment.

Clinical placements are considered a key part of health professional training (7,8), and assessment of student performance in this context informs competency development. However, quality observation and assessment in the clinical environment is difficult to achieve without a clear picture of what constitutes competence and what behaviors indicate that someone is competent (9). Competent EP graduates, who are well prepared for practice, are critical for the long-term health and well-being of the Australian community. Therefore, the aim of this study was to establish a set of core clinical learning competencies for Australian EP students that could be used to guide assessment during clinical placements.

## METHODS

### Research Design

This study used a mixed-methods, multiphase approach involving surveys and focus groups to establish a set of core clinical learning competencies (10). Figure 1 illustrates the phases used in this study. The study was approved by the University of Sydney Human Research Ethics Committee (Protocol No. 14555).

<sup>1</sup> Original Professional Standards for the AEP were developed by a process outlined in Selig et al. (3). These standards, originally implemented in 2008, have since been updated. Both the Exercise Science Standards and the AEP Professional Standards can be accessed via the Exercise and Sport Science Australia Web site ([https://www.essa.org.au/Public/Professional\\_Standards/The\\_professional\\_standards.aspx](https://www.essa.org.au/Public/Professional_Standards/The_professional_standards.aspx)).

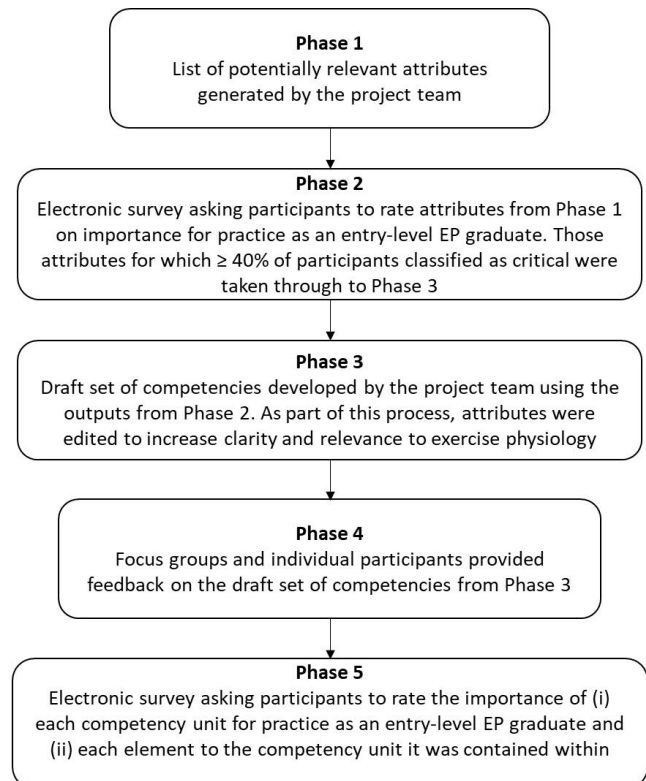


FIGURE 1. Overview of the sequence of phases used in the study. EP = exercise physiology.

### Participants

Across all phases of this study, participants were recruited from the following groups:

- AEPs, and/or
- university academic staff members with a teaching role related to clinical exercise practice, and/or
- university clinical/practicum coordinators who were responsible for clinical education of EP students undertaking practicum in environments related to clinical exercise practice.

Recruitment methods included an item in the electronic newsletter of the professional association, ESSA, and an e-mail to the department heads of all universities in Australia that offered a relevant degree. The e-mail requested distribution of the study information to potential participants who met the above criteria.

### Framework for Competencies

There is no agreed framework for describing competencies (11). For this project, we used the integrated approach proposed originally by the Australian National Office of Overseas Skills Recognition and as outlined by Goncz et al. (12). This integrated approach to describing competencies has been used or adapted by other allied health professions in Australia, including speech pathology, podiatry, physiotherapy (i.e., physical therapy in the United States), and dietetics (13).

The integrated approach “views competence in terms of knowledge, abilities, skills, and attitudes displayed in the context of a carefully chosen set of realistic professional tasks which are of an appropriate level of generality” (14, p. 405). The knowledge, abilities, skills, and attitudes are collectively referred to by Gonczi and Hager (14) as attributes required for competent performance. Furthermore, “the integrated view of competence is holistic in that it situates attributes in the kinds of contexts in which they are employed in the practice of the occupation” (14, p. 405). The integrated approach allows for flexibility in the competencies in that they can be applied to a broad range of workplace situations without favoring one situation over another (15). This approach is therefore well suited to any future use of the competencies for assessment purposes in that one set of competencies can be used in a range of clinical placement settings.

The competencies are articulated across several levels (the reader is referred to [16] for an overview of the definitions of these levels). Briefly, the first level, the unit of competency, describes major professional tasks or activities that describe practice. Underneath each unit lies a set of elements that more specifically describes what a person must be able to do to successfully undertake these tasks or activities. Underlying each element are performance criteria that describe the observable behaviors from which it can be inferred that a person has achieved entry-level competency in each element (16). Underneath the performance criteria is a range of variables, statements, and evidence guides, although these are considered optional when describing competency standards (12).

## Methodological Approach

### Phase 1

The project team, all of whom were aligned with one or more of the participant groups listed previously, identified potentially relevant attributes from a range of sources including (i) the AEP accreditation criteria, (ii) the AEP scope of practice, (iii) competency standards (or similar) for clinical exercise professionals (or similar) from other countries, and (iv) competency standards from a selection of other allied health professions in Australia. Overlap between sources was removed, and a consolidated list of 49 attributes was compiled for Phase 2 (Appendix S1).

### Phase 2

An electronic survey hosted by SurveyMonkey, Inc. (Palo Alto, California) was used to determine the attributes considered essential for an entry-level EP graduate at the beginning of his or her professional career who is client-centered and able to practice safely and effectively. Ninety-one participants responded to the survey (see Appendix S2 for participant details of entire sample). Because indirect and third-party recruitment methods were used, a return rate cannot be established. Participants were most often aged 21–29 years (45%; followed by 30–39 years, 34%) and were most often currently AEPs operating mainly in a clinical role (37.4%;

followed by university academics, 23.1%). Seventy-two participants identified as an AEP with experience (either presently or in the past) in clinical exercise practice (median: 5 years; range: 1–30 years). Forty-four participants indicated having experience as a university academic (median: 5 years; range: 1–30 years). Twenty-one participants indicated having experience as a practicum coordinator (median: 3 years; range: 1–18 years). Seventy percent of participants had supervised students undertaking placements in the area of clinical EP, with a median of 5 years of experience.

Participants were provided with the list of attributes from Phase 1 and asked to indicate for each whether they considered it *critical*; *not critical, but still important*; or *not critical and not important* with regard to an entry-level EP graduate at the beginning of his or her professional career who is client-centered and able to practice safely and effectively. Attributes that at least 40% of participants classified as critical were taken through to Phase 3. A conservative agreement threshold was selected (40%) to avoid loss of attributes that might later be considered critical by participants.

### Phase 3

Using the attributes from Phase 2, the project team identified the main groupings of work roles (i.e., units of competency) and, within these groupings, allocated the various attributes (i.e., elements). The project team also drafted performance criteria for each element. During this process, the team determined that some of the attributes fit better as performance criteria; therefore, they incorporated them into the draft set of competencies at this level rather than at the level of the element. Attributes were also edited to improve clarity and demonstrate relevance to the EP profession. In doing this editing, the overall intent of the attribute was not changed by the project team. Phase 3 was an iterative process and completed via e-mail discussion. All team members agreed with the resulting draft.

### Phase 4

A purposive sampling approach (17) was used to form 4 focus groups involving 16 participants with representation from metropolitan and regional areas. The focus group participants included AEPs ( $n = 8$ ), university academics with a teaching role related to clinical exercise practice ( $n = 5$ ), and university practicum coordinators who were also AEPs ( $n = 3$ ). The focus groups were conducted in Wollongong, Sydney, and Townsville. The mix of metropolitan and regional locations was used to reduce bias with respect to clinical work practices that might occur with particular locations.

A semistructured approach was used to explore opinions on the completeness, accuracy, and relevance to clinical practice of the competencies as a whole as well as each individual competency unit, the elements, and performance criteria. Participants were invited to suggest wording changes and to comment on the grouping of elements into the various competency units. The first focus group was presented with the draft set of competencies from Phase 3. Thereafter, the

focus groups received updated draft sets of competencies based on changes made in response to the outcomes of the previous focus group. Additional participants (2 AEPs, 1 academic, and 4 practicum coordinators who were also AEPs) who were unable to attend a focus group provided individual written feedback on the competencies. The iterative process of refining the competencies ceased when saturation was reached; that is, when subsequent consultation yielded no change in the competencies other than word substitution that did not alter the meaning and context of the statement.

### Phase 5

An electronic survey hosted by SurveyMonkey, Inc., was used to rate the importance of each competency unit to practice as an entry-level EP graduate and the importance of each element to the competency unit it was contained within. One hundred and twenty-six participants responded to the survey (see Appendix S2 for participant details of entire sample). As in Phase 2, recruitment approaches meant that a response rate could not be established. Participants were most often aged 21–29 years (49.6%; followed by 30–39 years, 31%) and were most often currently AEPs operating mainly in a clinical role (52.4%; followed by 16.6% both AEPs and university academics). Seventy-seven percent of participants had supervised students. Twenty-three of the participants identified themselves as new to the profession, having graduated within the last 2 years and having worked in the area of clinical EP for 1 year or less.

Participants were presented firstly with the competency units and then with the underpinning elements and asked to rate their importance on a 5 point scale ranging from highly unimportant to highly important. Participants who were new to the profession ( $n = 23$ ) completed an additional section of the survey. The additional items asked whether this subset of participants believed they were competent in the units of competency and whether they had demonstrated the underlying element in their work to a standard that would be consistent with an entry-level practitioner. The purpose of this additional part of the survey was to provide a first step validation phase to establish that the competencies were expressed around that of an entry-level practitioner.

## RESULTS

### Phase 2

Forty-five attributes from the original list of 49 were considered critical for an entry-level EP graduate by at least 40% of participants. The 4 items eliminated were as follows:

1. Applies contemporary forms of information management to relevant areas of practice.
2. Demonstrates a level of skill in the use of information technology appropriate to their practice.
3. Participates in quality improvement processes.
4. Facilitates an individual's access to appropriate health and community services.

### Phase 3

The first draft of competencies (Appendix S3) developed by the project team based on the output of Phase 2 included 6 units of competency with 19 underlying elements. The 6 units of competency were (i) communication, (ii) operating in a professional environment, (iii) professional behavior, (iv) assessment and interpretation, (v) planning and delivery of an intervention, and (vi) client-centered practice.

### Phase 4

Competency units were modified and reorganized after feedback by the participants in the first 2 focus groups questioned the linkage of the elements to the respective competency units proposed in Phase 3. First, participants were concerned by the generic nature of the competencies, as demonstrated by the following quotes:

“I wonder how far do you have to read between these competencies before it was clear that it was about EPs rather than about any health professional” (participant 1 from Focus Group 1).

“... it sort of just read like anyone, any allied health professional” (participant 2 from Focus Group 2, made in reference to the original planning and delivery unit).

Second, the lack of emphasis on clinical reasoning and insufficient detail around risk management were also noted:

“Clinical reasoning is implicit in selecting assessments and delivering an intervention, but doesn't come through in the document” (participant 2 from Focus Group 1).

“patient safety. . . did not come across strongly enough. . . needs to jump out more” (participant 1 from Focus Group 2).

The changes made to the Phase 3 draft included a reorganization of elements into a different set of competency units. The revised draft included 6 units. Four of these, assessment and interpretation, design and delivery of exercise programs, lifestyle modification, and risk management, were considered by participants to be essential areas of practice that needed to be highlighted to make the competencies more clearly and uniquely relevant to EP. The 2 units from the Phase 3 draft, operating in a professional environment and professional behavior, were consolidated into 1 unit on professionalism; the unit on client-centered practice was removed, and the concept of client-centeredness threaded throughout the other competency units, for example, in elements 1 and 2 of Unit 4 (see Figure 2). A similar approach was preferred by the participants for evidence-based practice; that is, rather than having evidence-based practice as a separate competency unit or element, it was threaded throughout. Although participants considered that there was a lack of emphasis on clinical reasoning in



**Competency Unit 1: Communication**

1. Communicates effectively with clients, carers, and general public
2. Communicates effectively with peers, colleagues, other health professionals, and external agencies
3. Effectively communicates exercise physiology data and management plans via oral and written reports or progress notes

**Competency Unit 2: Professionalism**

1. Behaves in a professional manner
2. Demonstrates reflective practice and a commitment to learning
3. Works effectively in a team environment
4. Able to adapt to the practice setting

**Competency Unit 3: Assessment and Interpretation**

1. Places the role of the clinical exercise physiologist in the wider context of the client's health care management
2. Accurately and efficiently collects subjective and objective data
3. Accurately interprets assessment data

**Competency Unit 4: Planning and Delivery of an Exercise and/or Physical Activity Intervention**

1. Designs safe and effective client-centered interventions
2. Facilitates the delivery of a safe and effective client-centered intervention
3. Integrates pathology into the planning and delivery of interventions

**Competency Unit 5: Lifestyle Modification**

1. Recognizes and addresses key elements of lifestyle modification in client communication and assessment
2. Facilitates behavior change and self-management with clients

**Competency Unit 6: Risk Management**

1. Takes an active approach to client safety
2. Ensures a safe exercise environment
3. Employs sound clinical reasoning to assessment and intervention decisions that are grounded in risk management
4. Self-manages personal risk

FIGURE 2. Final set of competencies.

the Phase 3 draft, the preferred way of handling this attribute was to thread elements of clinical reasoning explicitly into the risk management unit and implicitly into other units.

Thereafter, changes made in response to participant feedback included the addition of 2 new elements, eliminating redundancies, rewording to increase the emphasis on a client-centered approach, and changes to the performance criteria (additions, deletions, editing). Figure 2 shows the final set of competencies, described as 19 elements organized into 6 units of competency.

TABLE 1. Percentage of participants who considered each unit of competency as unimportant or important to practice successfully as an entry-level exercise physiologist.

Competency Unit	Unimportant	Neutral	Important
Communication	1.6	0	98.4
Professionalism	1.6	0.8	97.6
Assessment and interpretation	1.6	0.8	97.6
Planning and delivery	1.6	0.8	97.6
Lifestyle modification	2.4	3.2	94.4
Risk management	3.2	3.2	93.6

**Phase 5**

The majority of participants considered each unit of competency as being important to practicing successfully as an entry-level practitioner (Table 1). Furthermore, the majority of participants considered each element underpinning a unit of competency to be important to that unit of competency (Table 2).

The majority of the subgroup who identified as new to the profession considered themselves competent in each unit of competency (Table 3). Furthermore, the majority of this subgroup believed they demonstrated all elements underpinning each competency unit to a standard that would at least be consistent with an entry-level practitioner (Table 4).

**DISCUSSION**

This article presents our research participants' conceptualization of the attributes of an EP graduate at the beginning of their professional career as a set of core clinical learning competencies aligned with an established competency framework (12). The competencies included discipline in specific attributes, for example, design and delivery of exercise programs, along with more generic attributes covering communication and professionalism. The competencies derived from a systematic and rigorous process of investigation that resulted in high acceptability and face validity; that is, the units of competency and their underlying elements were all considered important to practice successfully as an entry-level practitioner, and the majority of those who were new to the profession thought they were able to demonstrate each element at the level expected of an entry-level practitioner. While not intended as a replacement for ESSA's existing AEP Professional Standards, the competencies could enhance the existing standards by guiding clinical placement curriculum and assessment. In addition, given that an aging population is a global phenomenon (18) and the strong evidence base supporting the benefits of exercise and physical activity in the prevention and management of many chronic diseases associated with aging (2), the competencies may be relevant to the education of clinical exercise professionals internationally.

TABLE 2. Percentage of participants who considered each element as unimportant or important.

Competency Unit/Element	Unimportant	Neutral	Important
Communication			
Communicates effectively with clients, carers, and general public.	2.4	0	97.6
Communicates effectively with peers, colleagues, other health professionals, and external agencies.	2.4	2.4	95.9
Effectively communicates exercise physiology data and management plans via oral and written reports or progress notes.	2.4	3.3	94.3
Professionalism			
Behaves in a professional manner.	1.6	0	98.4
Demonstrates reflective practice and a commitment to learning.	1.6	1.6	96.7
Works effectively in a team environment.	1.6	3.3	95.1
Able to adapt to the practice setting.	1.6	0	98.4
Assessment and interpretation			
Places the role of the clinical exercise physiologist in the wider context of the client's health care management.	0.8	5	94.2
Accurately and efficiently collects subjective and objective data.	1.7	4.1	94.2
Accurately interprets assessment data.	1.7	2.5	95.9
Planning and delivery			
Designs safe and effective client-centered interventions.	1.6	0.8	97.5
Facilitates the delivery of safe and effective client-centered interventions.	1.6	0	98.3
Integrates pathology into the planning and delivery of interventions.	1.6	3.3	95.8
Lifestyle modification			
Recognizes and addresses key elements of lifestyle modification in client communication and assessment.	1.6	3.3	95
Facilitates behavior change and self-management with clients.	0.8	8.3	90.8
Risk management			
Takes an active approach to client safety.	2.5	1.7	95.8
Ensures a safe exercise environment.	1.7	0.8	97.5
Employs sound clinical reasoning to assessment and intervention decisions that are grounded in risk management.	1.7	1.7	96.6
Self-manages personal risk.	1.7	5	93.3

Some of the competency units have commonalities with other health professional competency standards. The first 2 units describing communication and professionalism overlap with several other professions, for example, occupational therapy (19) and speech pathology (20). This overlap in competencies between professions is consistent with the examination by Verma et al. (21,22) of the core competencies that are common among several Canadian health care professions and the work of Grace et al. (23) among Australian allied health professions. Similarly, the Learning and Teaching Academic Standards project identified 6 common entry-level threshold learning outcomes across 26 health care disciplines in Australia (24). While overlap exists, the final set of competencies described within this project included 4 units that identify major professional tasks that are core to clinical EP practice: assessment and interpretation, planning and delivery of an exercise and/or physical

TABLE 3. Percentage of new accredited exercise physiologists' beliefs of their competence with each competency unit.

Competency Unit	Not Competent	Neutral	Competent
Communication	4.3	0	95.6
Professionalism	4.3	0	95.6
Assessment and interpretation	4.3	17.4	78.3
Planning and delivery	4.3	13.0	82.6
Lifestyle modification	8.7	8.7	82.6
Risk management	4.3	8.7	87.0

TABLE 4. Percentage of new accredited exercise physiologists who believe they do or do not demonstrate each element at a level consistent with an entry-level exercise physiologist.

Competency Unit/Element	Yes	No	Unsure or No Opportunity
<b>Communication</b>			
Communicates effectively with clients, carers, and general public.	95.7	0	4.3
Communicates effectively with peers, colleagues, other health professionals, and external agencies.	91.3	4.3	4.3
Effectively communicates exercise physiology data and management plans via oral and written reports or progress notes.	91.3	4.3	4.3
<b>Professionalism</b>			
Behaves in a professional manner.	95.7	0	4.3
Demonstrates reflective practice and a commitment to learning.	95.7	4.3	0
Works effectively in a team environment.	95.7	0	4.3
Able to adapt to the practice setting.	91.3	0	4.3
<b>Assessment and interpretation</b>			
Places the role of the clinical exercise physiologist in the wider context of the client's health care management.	95.7	0	4.3
Accurately and efficiently collects subjective and objective data.	87.0	4.3	8.7
Accurately interprets assessment.	87.0	4.3	8.7
<b>Planning and delivery</b>			
Designs safe and effective client-centered interventions.	82.6	0	17.4
Facilitates the delivery of safe and effective client-centered interventions.	95.7	0	4.3
Integrates pathology into the planning and delivery of interventions.	87.0	8.7	4.3
<b>Lifestyle modification</b>			
Recognizes and addresses key elements of lifestyle modification in client communication and assessment.	87.0	0	13.0
Facilitates behavior change and self-management with clients.	82.6	4.3	13.0
<b>Risk management</b>			
Takes an active approach to client safety.	95.7	0	4.3
Ensures a safe exercise environment.	95.7	0	4.3
Employs sound clinical reasoning to assessment and intervention decisions that are grounded in risk management.	87.0	8.7	4.3
Self-manages personal risk.	78.2	0	21.7

activity intervention, lifestyle modification, and risk management. The statements contained within the unit of competency description, elements, and performance criteria further contextualized these units of competency to clinical exercise practice. Indeed, this contextualization was identified as missing by the first 2 focus groups in Phase 4 and led to changes to the original draft of competencies put forward for consideration in this phase. Importantly, many elements contained within these units of competency align with parts of the AEP Professional Standards (6) and therefore demonstrate the potential of the derived clinical learning competencies to complement the existing AEP standards.

In the draft set of competencies resulting from Phase 3, client-centered practice was proposed as a unit of competency. However, in Phase 4, the focus groups commented

that client-centered practice is essential to everything an EP does. Therefore, as part of the revision during Phase 4, the unit of client-centered practice was removed and the concept instead threaded through the various units of competency. A similar approach was taken for the area of evidence-based practice. When one considers the several levels in the competency framework of Gonzci et al. (12), this change appears justified. Units of competency describe major work roles of the profession, whereas elements describe what an individual must do to fulfill these work roles (16). The revised competencies better match these definitions; for example, "Unit 4: planning and delivery of an exercise and/or physical activity intervention" is a core work role for an EP student on clinical placement. Being client centered in their approach, as described in the underlying elements "designs safe and

effective client-centered interventions” and “facilitates the delivery of a safe and effective client-centered intervention,” is an important part of being able to achieve that work role.

Defining competence is critical for professional accountability and is widespread across the health professions. However, while competency frameworks offer a convenient means of describing the types of attributes required to practice and the minimum level of performance required to enter the profession, it is unlikely that any competency framework will capture the full complexity of what it means to be that particular health care professional. Furthermore, competency frameworks are set at a point in time, but the reality of professional practice is that tasks and roles change. Therefore, the clinical learning competencies presented within this article should be subject to further critical review and revision in a way that allows not only updating of competency units, elements, and performance criteria, but for innovations in the way competency is conceptualized. This suggestion of regular review is consistent with the approach other allied health professions take to their professional competency standards (e.g., 25,26). A planned approach to review will help ensure that the competencies remain a reflection of contemporary EP practice that may change in response to future roles, and if used to inform curriculum and assessment, support preparation of EP students for professional practice.

### Limitations of the Study

In the process of refining the competencies, we sought input from AEPs, academics, and practicum coordinators in both

metropolitan and regional locations across two Australian states. We acknowledge, though, that the final set of competencies may be influenced by areas of practice that are unique to these locations and may not fully capture the unique areas of practice in other states of Australia. Additionally, it is possible that the competencies may have been influenced by the setting in which participants worked and the types of clients with whom those in a clinical role had experience; however, we cannot determine this influence with the data collected in this study. It is also possible that the views of those who played the biggest role in refining the competencies (focus group participants and individual consultations in Phase 4) may not be consistent with all AEPs, academics, and practicum coordinators; however, the widespread view in the final survey of the importance of all competency units and elements suggests this may not have been the case.

### CONCLUSIONS

The competencies presented in this study resulted from an extensive, iterative process involving those with expertise in the area followed by a first-step validation. The competencies will have a range of clinical learning applications, including informing curriculum, preparing a student for clinical placement, development of a student placement assessment tool, and increasing the capacity for academics and clinical supervisors to assess a graduating student's capacity to practice safely and confidently as an exercise physiologist.

### REFERENCES

- Booth FW, Gordon SE, Carlson CJ, Hamilton MT. Waging war on modern chronic diseases: primary prevention through exercise biology. *J Appl Physiol*. 2000;88(2):774–87.
- Pedersen BK, Saltin B. Exercise as medicine—evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand J Med Sci Sports*. 2015;25(S3):1–72.
- Selig S, Coombes JS, Otago L, Pascoe D, Raymond J, Torode M, Groeller H. The development of an accreditation scheme for Accredited Exercise Physiologists in Australia. *Focus Health Prof Educ*. 2011;13(2):89–102.
- McAllister L, Nagarajan SV. Accreditation requirements in allied health education: strengths, weaknesses and missed opportunities. *J Teach Learn Grad Employ*. 2015;6(1):2–24.
- Exercise & Sport Science Australia. The professional standards documents: exercise science standards. [https://www.essa.org.au/Public/Professional\\_Standards/The\\_professional\\_standards.aspx](https://www.essa.org.au/Public/Professional_Standards/The_professional_standards.aspx). Updated 2013. Accessed March 20, 2019.
- Exercise & Sport Science Australia. The professional standards documents: accredited exercise physiologist professional standards. [https://www.essa.org.au/Public/Professional\\_Standards/The\\_professional\\_standards.aspx](https://www.essa.org.au/Public/Professional_Standards/The_professional_standards.aspx). Updated 2015. Accessed March 20, 2019.
- Billett S, Sweet L, Glover P. The curriculum and pedagogic properties of practice-based experiences: the case of midwifery students. *Vocations Learn*. 2013;6(2):237–57.
- Nagarajan SV, McAllister L. Integration of practice experiences into the allied health curriculum: curriculum and pedagogic considerations before, during and after work-integrated learning experiences. *Asia Pac J Coop Educ*. 2015;16(4):279–90.
- McAllister S, Lincoln M, Ferguson A, McAllister L. Issues in developing valid assessments of speech pathology students' performance in the workplace. *Int J Lang Comm Dis*. 2010;45(1):1–14.
- Creswell JW, Plano Clark VL. Designing and conducting mixed methods research. 2nd ed. Thousand Oaks (CA): Sage Publications, Inc.; 2011.
- Englander R, Cameron T, Ballard AJ, Dodge J, Bull J, Aschenbrener CA. Toward a common taxonomy of competency domains for the health professions and competencies for physicians. *Acad Med*. 2013;88(8):1088–94.
- Goncz A, Hager P, Oliver E. Establishing competency-based standards in the professions. National Office of Overseas Skills Recognition Research Paper No. 1, DEET. Canberra: Australian Government Publishing Service; 1990.
- Community Services and Health Industry Training Board. Competency standards for health and allied health professionals in Australia. Melbourne: Department of Human Services, Victorian Government; 2005.



14. Gonczi A, Hager P. The competency model. In: Peterson P, Baker E, McGaw B, editors. *International encyclopedia of education*. Vol 8. Oxford, UK: Elsevier; 2010. p. 403–10.
15. Hager P, Gonczi A. What is competence? *Med Teach*. 1996;18(1):15–8.
16. Ash S, Phillips S. What is dietetic competence? Competency standards, competence and competency explained. *Aust J Nutr Diet*. 2000;57(3):147–51.
17. Teddlie C, Yu F. Mixed methods sampling: a typology with examples. *J Mixed Meth Res*. 2007;1(1):77–100.
18. United Nations, Department of Economic and Social Affairs, Population Division. *World population prospects: the 2017 revision, key findings and advance tables*. Working Paper No. ESA/P/WP/248. New York: United Nations; 2017.
19. Occupational Therapy Board of Australia. *Australian occupational therapy competency standards 2018*. Melbourne, Australia: Occupational Therapy Board of Australia; 2018.
20. Speech Pathology Association of Australia. *Competency-based occupational standards for speech pathologists: entry level, 2011*. Melbourne, Australia: Speech Pathology Association of Australia Limited; 2011, updated July 2017.
21. Verma S, Patterson M, Medves J. Core competencies for health care professionals. What medicine, nursing, occupational therapy and physiotherapy share. *J Allied Health*. 2006;35(2):109–15.
22. Verma S, Broers T, Patterson M, Schroder C, Medves J, Morrison C. Core competencies: the next generation. Comparison of a common framework for multiple professions. *J Allied Health*. 2009;38(1):47–53.
23. Grace S, Innes E, Joffe B, East L, Coutts R, Nancarrow S. Identifying common values among seven health professions; an interprofessional analysis. *J Interprof Care*. 2017;31(3):325–34.
24. Henderson A, O’Keefe M. *Learning and teaching academic standards (LTAS): health, medicine and veterinary science*. Canberra, Australia: Australian Learning and Teaching Council Limited; 2010.
25. Ash S, O’Connor J, Anderson S, Ridgewell E, Clarke L. A mixed-methods research approach to the review of competency standards for orthotist/prosthetists in Australia. *Int J Evid Based Healthc*. 2015;13(2):93–103.
26. Kiely PM, Slater J. Optometry Australia entry level competency-standards for optometry. *Clin Exp Optom*. 2015;98(1):65–89.