

## Interprofessional education in allied health: a systematic review

Rebecca Olson<sup>1</sup> & Andrea Bialocerkowski<sup>2</sup>

**OBJECTIVES** During the past decade, several studies have systematically reviewed interprofessional education (IPE), but few have inclusively reviewed this literature. None has focused primarily on IPE in allied health, despite differences in recruitment and socialisation across the health professions. This systematic review seeks to uncover the best approach to pre-licensure, university-based allied health IPE to determine which aspects require modification in which contexts to provide optimal learning experiences.

**METHODS** A systematic search of 10 databases was conducted for articles published in English, between January 1998 and January 2013. Studies were included if they used quantitative or qualitative methodologies to report on the outcomes associated with IPE in allied health. Two independent reviewers identified studies that met the inclusion criteria, critically appraised the included studies and extracted data relating to the effectiveness of IPE in allied health. Data were synthesised narratively to address the study aims.

**RESULTS** Large gaps – relating to methods, theory and context – remain within this body of literature. Studies measured students' attitudes and understanding of other health professional roles, teamwork and knowledge in response to IPE interventions using patient scenarios, lectures and small-group work. Differences in power and curriculum placement were described as factors affecting IPE effectiveness.

**CONCLUSIONS** Evaluation remains the primary aim within this literature. Few studies use theory, take an inductive approach to understanding the processes behind IPE or include detailed participant descriptions. Therefore, we suggest that IPE research is currently caught in an epistemological struggle, between assumptions underpinning biomedical and health science research, and those underpinning education studies. As part of a systems approach to understanding interprofessional socialisation, we call for researchers to take a realistic approach to evaluation that is inclusive of, and responsive to, contextual factors to explore how IPE leads to improved long-term outcomes in differing circumstances.

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<sup>1</sup>School of Science and Health, University of Western Sydney, Penrith, New South Wales, Australia

<sup>2</sup>Griffith Health Institute, Griffith University, Gold Coast, Queensland, Australia

*Correspondence:* Rebecca Olson, Locked Bag 1797, Penrith, New South Wales 2571, Australia. Tel: 00 612 4620 3226; E-mail: [rebecca.olson@uws.edu.au](mailto:rebecca.olson@uws.edu.au)

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## INTRODUCTION

For the past decade, patient care has become less focused on acute conditions, which are institutionally managed, and more focused on chronic disorders, which are typically managed in the community<sup>1,2</sup> and address quality-of-life issues.<sup>3</sup> This shift means that patients are reliant on complex organisations of services involving various health professionals across a variety of settings.<sup>2</sup> Patients and carers often describe experiences of falling through the ‘cracks’ and feeling ‘lost’ because of poor communication and collaboration between health professionals who are providing treatment. This tends to result in a lack of continuity of care.<sup>4,5</sup>

To address these undesirable aspects of health care, interprofessional education (IPE) is being progressively introduced into university-based medicine, nursing and allied health curricula to improve teamwork and to increase the understanding of roles across health care.<sup>5,6</sup> Interprofessional education consists of students from different health-related professions learning ‘from, with and about each other to improve collaboration and the quality of care’,<sup>7</sup> interprofessional learning refers to the practice, ideally stemming from IPE, of promoting ‘effective communication, collaboration and teamwork within healthcare settings to improve patient care and student clinical learning outcomes’.<sup>8</sup>

Many articles have been published on the development and delivery of IPE; yet there is a paucity of contextual and synthesised evidence on its effectiveness. In 2005, for example, Oandasan and Reeves<sup>9</sup> likened the current state of the literature on IPE to an incomplete recipe: ‘We know many of the ingredients that are needed, but may not be sure how best to mix them together to create effective IPE’. Limitations of published systematic reviews on this topic include a lack of evaluation of changes in knowledge, attitudes and behaviours associated with participating in IPE in the medium and long-term, and limited inclusion of educational, psychological and sociological theories to inform IPE activities. Moreover, much of the literature has focused on post-qualification, clinic-based interprofessional learning.<sup>9–12</sup> There is doubt whether the results of primary studies and systematic reviews of practising health professionals can be applied to pre-qualification students, as the learning context appears to be of importance in IPE.<sup>13</sup> Thus, there is a need for further inquiry into pre-qualification, university-based IPE.

Similarly, there is a need for a better understanding of IPE in allied health university curricula, as medicine and nursing have been the primary foci of IPE to date.<sup>11</sup> Interprofessional education models used in medical and nursing university curricula should not be assumed to be transferable into allied health curricula, as allied health refers to a collective of disparate health professions, varying in aspects such as service delivery models and pedagogical approaches to education. Moreover, internationally, the scope of practice of many allied health professions differs considerably.<sup>14</sup> Thus, it is important to consider the geographical and institutional context in which IPE is conducted.

Student factors, such as their social, economic and cultural backgrounds, as well as the stereotypes, expectations and attitudes that they bring to higher education, vary considerably between institutions even within one health profession course, and will probably influence IPE experiences and learning.<sup>15–17</sup> This means that effective IPE activities in one university may not be as effective elsewhere. A comprehensive and systematic evaluation of the IPE literature, to date, has not focused on student factors and their potential impact on IPE.

Thus, to systematically identify similarities and differences in IPE models and activities, to move beyond assumptions of transferability, this systematic review sought to describe the:

- Models of university-based allied health IPE in terms of, but not limited to, the mode of delivery and duration of IPE activities, class sizes, placement of IPE activities within the curriculum, participating health professions, institutional and student characteristics;
- Outcomes associated with university-based allied health IPE in terms of, but not limited to, process outcomes, patient and client outcomes and their sustainability.

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## METHODS

### Study eligibility

For studies to be included in this systematic review, they had to describe the outcome of IPE activities performed by pre-qualification students undertaking university courses in the allied health professions: health services management, podiatry, physiotherapy or occupational therapy. These four allied

health courses were selected to represent a broad range of student characteristics and pedagogical approaches. Interprofessional education activities were defined as those that involved students from one or more of the allied health professional courses listed above interacting with other health professional students for the explicit purpose of improving interprofessional collaboration or the health and well-being of patients and clients. Primary studies that were included used quantitative, qualitative or mixed-methods, and were published in English between 1988 (the year the World Health Organization report on IPE was published<sup>18</sup>) and January 2013.

### Data sources and search strategies

An expert in systematic reviews developed a comprehensive and systematic search strategy, based on the key words used from existing systematic reviews on IPE<sup>2</sup> and the unique functions associated with each of the databases searched (e.g. medical subject headings [MeSH], truncation symbols, Boolean operators). Ten databases were searched: AMED, EMBASE, CINAHL, Cochrane, Medline, Pubmed, PEDro, Sportdiscus, Science Direct and Web of Knowledge (Appendix S1 available online). Reference lists of included articles were also reviewed to identify other articles meeting the inclusion criteria.

### Study selection and data extraction

Two independent researchers applied the inclusion criteria (detailed below in 'Study eligibility') to the database hits by first reviewing each study's title and abstract. The full text version of the study was subsequently reviewed if the study appeared to meet the selection criteria or if there was any doubt regarding the study's eligibility. A third, independent, researcher resolved any disagreements.

The quality of the included studies was subsequently evaluated by two researchers, using standardised critical appraisal tools. Given the broad inclusion criterion with respect to study design, three different critical appraisal tools were used: McMaster Critical Review Form for Qualitative Studies,<sup>19</sup> McMaster Critical Review Form for Quantitative Studies<sup>20</sup> and McGill Mixed-Methods Appraisal Tool.<sup>21</sup> Any disagreements were resolved by discussion with a third, independent, researcher. Scores were calculated using the appropriate tool, then converted to a percentage to allow for comparison between study designs.

The researchers extracted the following data using a purpose-built, standardised data-extraction tool:

- The IPE model, including the mode of delivery and the duration of IPE activities, class sizes, placement of IPE activities within the curriculum, participating health professions;
- Institutional characteristics, including location and competitiveness;
- Student characteristics, including age, gender, socio-economic and cultural characteristics;
- Theories used to plan IPE programmes or to understand IPE outcomes;
- IPE outcomes from multiple stakeholder perspectives, including the patient or client (e.g. quality of care), student (e.g. extent of student learning) and administrator (e.g. sustainability).

### Data syntheses and analyses

Agreement between the researchers on the methodological quality of the included studies was established by the calculation of percentage agreement and the Kappa statistic. Data extracted were synthesised in a narrative manner, using an integrative and aggregative approach, to gain an in-depth understanding of the factors that may affect IPE.<sup>22,23</sup> The competitiveness of universities described in each study was determined using the *Times Higher Education World University Rankings 2012–2013*.<sup>24</sup> Universities ranked in the top 400 were described as highly competitive. Universities not ranked in the top 400 were described as competitive. Junior and community colleges were described as non-competitive.

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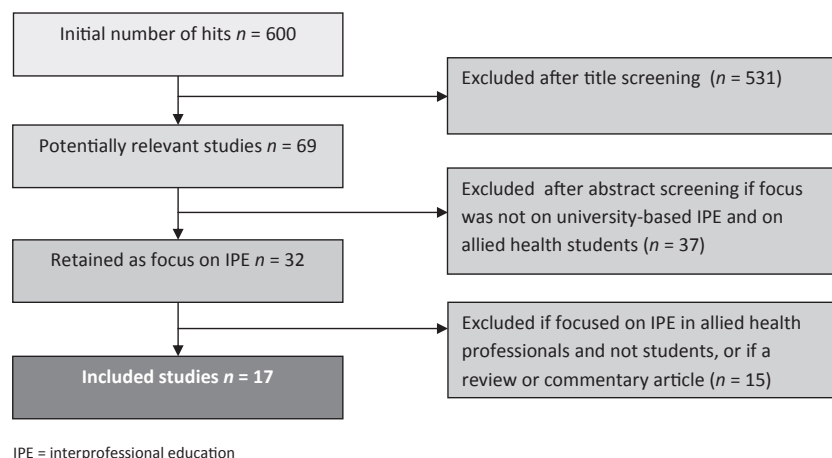
## RESULTS

### Trial flow

In total, 17 studies met the criteria and were included in the analyses. This included nine mixed-methods studies,<sup>19,21,25–31</sup> three qualitative studies<sup>20,32,33</sup> and five quantitative studies.<sup>14,34–37</sup> Pre- and post-<sup>14,21,25,27–29,31,34–37</sup> or post-intervention surveys,<sup>19,20,26,30</sup> supplemented by focus groups<sup>21,25–27,29–31</sup> or open-ended questionnaires,<sup>19,28,33</sup> featured in most studies. The study selection process is illustrated in Fig. 1.

### Methodological quality

There was 91% agreement ( $\kappa = 0.805$ , 95% confidence interval 0.730–0.877) between independent researchers regarding the quality of reporting and



**Figure 1** Study selection process

the methodology in the articles. All disagreements were resolved by discussion with the third, independent, researcher. The study quality was variable, with scores ranging from 42% to 92%. Studies that used mixed or quantitative methods tended to score higher on reporting and methodological quality compared with those that used qualitative designs. In general, the criteria relating to sampling and data collection or outcome measurement lacked detail. There was a lack of clear description of participants' characteristics, low response rates and lack of consideration for the researchers' potential influence on participants.

## Findings

See Table 1 for an overview of the findings.

### Mode of IPE

Patient scenarios or simulation and practice-based learning featured in most IPE interventions.<sup>14,19–21,25–31,33,34,36,37</sup> One IPE intervention involved lectures or small-group work focusing on teamwork, not a simulated patient.<sup>35</sup> The format of patient-focused IPE activities varied, from synchronous<sup>29</sup> and asynchronous<sup>26</sup> online discussions, to small-group activities lasting a few hours,<sup>25,28,30,31,33,36,37</sup> to a combination of small- and large-group activities lasting one or more days.<sup>14,20,34</sup> Two interventions lasted one or more semesters.<sup>19,35</sup> Interprofessional education activities ranged in size from < 50,<sup>21,28–31</sup> to 50–200,<sup>14,19,20,26,33,35–37</sup> to 540<sup>34</sup> and 1197<sup>25</sup> students.

Studies involving a comparison of more than one IPE activity provided insight into factors that would probably shape the effectiveness of IPE activities.

Interprofessional education activities were perceived as more relevant and successful when participants worked in small and stable groups,<sup>32,34</sup> rather than large lectures,<sup>35</sup> to address patient scenarios.<sup>33,34</sup>

### Institutional characteristics

The majority of studies were conducted in Canada ( $n = 7$ )<sup>21,25,27,32,34,36,37</sup> or the USA ( $n = 6$ ).<sup>14,20,29–31,33</sup> None of the studies provided detailed descriptions of the institutions where the IPE activities were undertaken, despite underscoring the influence of organisational factors.<sup>32</sup> Most authors provided the name of the institutions involved in the interventions, allowing us to infer their competitiveness. Most of the universities were rated as highly competitive,<sup>19,21,25,28,34</sup> or competitive.<sup>14,20,26,29–31,33,35</sup>

### Student characteristics

The pre-licensure students involved in the studies were primarily undergraduates with varying levels of experience, from their first to fourth year of study.<sup>21,25–27,29–31,34,35</sup> Three studies included post-graduate students exclusively.<sup>14,20,33</sup> Most studies involved physiotherapy ( $n = 15$ )<sup>14,19–21,25,26,28,29,31–37</sup> or occupational therapy ( $n = 10$ )<sup>21,25,29,30,32–37</sup> students. Podiatry students were not found in any of the studies in this review; health services management students were found in one.<sup>27</sup> Other health professions involved in IPE activities most often included nursing ( $n = 13$ ),<sup>19,21,25,27–32,34–37</sup> pharmacy ( $n = 8$ )<sup>21,25,29,31,32,34,36,37</sup> or medicine ( $n = 7$ ).<sup>19,21,25,28,31,32,34</sup>

Background information beyond the profession and year of study was lacking in most studies. Seven studies described the gender of participants ( $\mu = 78\%$

Table 1 Overview of studies

	Baker et al. <sup>32</sup>	Buckley et al. <sup>28</sup>	Cameron et al. <sup>25</sup>	Cavanaugh and Konrad <sup>20</sup>
Mode of delivery	n/a	Role-play simulation involving three different scenarios	Skits, discharge scenarios, small-group discussions and activities	Discussion and role modelling of a team meeting of a simulated patient with disabilities; discussion with people in the community with disabilities
Class size	n/a	~10	1197	73
Duration	n/a	4 hours	2.5 hours	2 days
Placement within curriculum	n/a	2nd year to postgraduate	1st year	Postgraduate
Participating health professions	Dietetics, medicine, nursing, occupational therapy, pharmacy, physical therapy, social work and speech and language therapy	Medicine, nursing, operating department practice, physiotherapy and radiography	Dentistry, medical radiation, medicine, nursing, occupational therapy, pharmacy, physical therapy, social work and speech language pathology	Physical therapy and social work
Institution	Multiple, n/a	University of Birmingham, Birmingham City University, Worcester University	University of Toronto	University of New England
Location	(Canada)	UK	Canada	USA
Rank	n/a	(Highly competitive, competitive, competitive)	(Highly competitive)	(Competitive)
Age (years)	n/a	n/a	n/a	n/a
Gender	n/a	n/a	n/a	n/a
Socio-economic	n/a	n/a	n/a	n/a
Cultural	n/a	n/a	n/a	n/a
Name	Witz's (1992) model of professional closure	n/a	n/a	n/a
Focus	Power	n/a	n/a	n/a
Level	Student	Student	Student	Student
Findings	IPE can result in improved respect for and awareness of others' roles, but power struggles may impede IPE interventions	IPE simulation led to improved understanding of other professional roles and interprofessional interaction confidence, but benefits differ across professions with medical students reporting more concern in giving feedback	IPE can result in improved respect for and understanding of other professional roles, but limited engagement by medical students may impede IPE interventions	A three-session IPE intervention, involving simulation and patients from the community, can lead to improved understanding of other health professions' roles and effective person-centred communication
	Kenaszchuk et al. <sup>36</sup>	Mohaupt et al. <sup>37</sup>	Seefeldt et al. <sup>29</sup>	Shoemaker et al. <sup>33</sup>
Mode of delivery	Large-group workshop featuring a lecture and a problem-based case featuring an elderly woman after a fall	Workshop including a seminar, three small-group simulations and three debriefing sessions	Web-based small-group discussions of a mock patient case using Second Life	Staggered simulations involving six standardised patients as burn victims and high-grade simulation technology
Class size	131	84	47	64
Duration	3 hours	8 hours	1 hour	4 hours
Placement within curriculum	2nd year, 4th year and postgraduate	Final year	1st–3rd year	Postgraduate
Participating health professions	Exercise science and lifestyle management, funeral services, nursing, paramedics, occupational therapist assistant, personal support workers, pharmacy technician, physical therapist assistant and social services	Nursing, occupational therapy assistant paramedics, pharmacy technician and physical therapy assistant	Nursing, pharmacy, physical therapy, physician assistants and occupational therapy	Occupational therapy and physiotherapy
Institution	'Large college in Toronto' (Humberland College Institute of Technology and Advanced Learning)	'Large urban Ontario College'	South Dakota State University and University of South Dakota	Grand Valley State University
Location	Canada	Canada	USA	USA
Rank	(Non-competitive)	(Non-competitive)	(Competitive)	(Competitive)
Age (years)	Mean 20–24	Median 18–24	n/a	n/a
Gender	77% female; 22% male	73% female; 27% male	n/a	n/a
Socio-economic	n/a	n/a	n/a	n/a
Cultural	n/a	n/a	n/a	(Caucasian) – the group is described as lacking cultural diversity
Name	n/a	Allport's (1954) intergroup contact theory	n/a	n/a
Focus	n/a	Effective inter-group learning activities	n/a	n/a
Level	Student	Student	Student	Student
Findings	Large-group IPE can lead to improved perceptions of competency, teamwork skills and others' autonomy, especially among experienced students	Small improvements in attitudes to IPE can be achieved through case-based simulation teamwork. Senior students may be more receptive to positive attitude change because of their improved role knowledge	Second Life virtual IPE, case-based discussions can lead to improved perceptions of the importance of collaboration, but technical challenges need to be addressed	IPE can facilitate the development of teamwork skills and professional relationship, but the tendency for certain students or professions to dominate may impede IPE interventions

IPE = interprofessional education; PBL = practice-based learning; n/a = not available in the article. Parentheses are used to indicate that this information is implied, not explicit.

Cusack and O'Donoghue <sup>19</sup>	Davies et al. <sup>26</sup>	Eccott et al. <sup>27</sup>	Gaudet et al. <sup>27</sup>	Hayashi et al. <sup>35</sup>
<p>Practiced-based learning, group work, lectures, seminars and self-directed learning</p> <p>92 2 semesters n/a</p> <p>Diagnostic imaging, medicine, nursing and physiotherapy</p> <p>University College Dublin Ireland (Highly competitive)</p> <p>Mean 18 76% female; 24% male n/a n/a Constructivist learning theory</p> <p>Meaningful learning activities Student Small-group PBL-based IPE can be a valued opportunity to practice collaboration in undergraduate health professional education</p>	<p>WebCT: online learning involving asynchronous discussions of patient scenarios &gt; 100 3–4 years Ongoing</p> <p>Dietetics, physiotherapy and 11 other professions (not described)</p> <p>Coventry University UK (Competitive)</p> <p>20–24 88% female; 12% male n/a n/a n/a</p> <p>n/a Student IPE can result in improved respect for and understanding of other professional roles, but limited engagement by medical students may impede IPE interventions</p>	<p>Practiced-based case scenario involving a new mother</p> <p>24 n/a 1st–4th year</p> <p>Medicine, nursing, occupational therapy, pharmacy and physical therapy</p> <p>University of British Columbia Canada (Highly competitive)</p> <p>n/a n/a n/a n/a n/a</p> <p>n/a Student Small-group PBL-based IPE can lead to improved understanding of other health professional roles, patient-centred care and improved confidence in one's own professional role</p>	<p>Problem-based scenarios, oral health and client assessment tools</p> <p>n/a n/a 1st–4th year</p> <p>Dental services, health promotion, health services management and nursing</p> <p>George Brown College Canada (Non-competitive)</p> <p>n/a n/a n/a n/a Barr et al.'s (2005) IPE outcomes typology Levels of change Administrator Staff 'champions' are central to the facilitation and sustainability of IPE</p>	<p>(1) multiprofessional lectures and (2) small interprofessional groups focusing on teamwork</p> <p>(1) 160; (2) 188 1 semester (1) 1st year; (2) 3rd year</p> <p>Laboratory sciences, nursing, occupational therapy and physical therapy</p> <p>Gunma University Japan (Competitive)</p> <p>n/a n/a n/a n/a n/a</p> <p>n/a Student Third-year teamwork training interventions can lead to improved attitudes towards collaboration, but first-year multiprofessional lectures may decrease attitudes towards and readiness for IPE</p>
Titzer et al. <sup>30</sup>	Wamsley et al. <sup>31</sup>	Watt-Watson et al. <sup>34</sup>	Wellmon et al. <sup>14</sup>	
<p>SimMan simulations involving a middle-aged man with intestinal obstruction and chronic illness, a web-based video and post-simulation discussions</p> <p>4 × 32–33 students n/a 1st–4th year</p> <p>Nursing, occupational therapy, radiologic technology and respiratory therapy</p> <p>University of Southern Indiana USA (Competitive) n/a 88% female; 12% male</p> <p>n/a n/a</p> <p>Benner's theory (1984)</p> <p>Effective learning Student Simulation IPE can improve understanding of collaboration and own and other health professional roles; senior students value simulations more</p>	<p>Small-group simulation involving a standardised patient (actor) with multiple health problems</p> <p>~22 × 4–5 students 4 hours 2nd–4th year</p> <p>Dentistry, medicine, nursing, pharmacy and physical therapy</p> <p>(University of California, San Francisco) USA (Competitive) n/a 74% female; 26% male</p> <p>n/a n/a</p> <p>n/a</p> <p>n/a Student IPE can lead to improved attitudes towards teamwork, but not towards sharing participation and leadership, and not among dentistry and medicine students</p>	<p>Small-group activities on standardised patients, patient panel discussions, large interprofessional lectures and group discussions</p> <p>540 20 hours (over 5 days) 2nd and 3rd year</p> <p>Dentistry, medicine, nursing, occupational therapy, pharmacy and physical therapy</p> <p>University of Toronto Canada (Highly competitive) n/a n/a</p> <p>n/a n/a</p> <p>n/a</p> <p>n/a Student IPE can lead to improvements in knowledge and beliefs about pain management and greater awareness of others' roles, but lack of perceived relevance of the activity and negative attitudes towards other health professional students may impede IPE interventions</p>	<p>Large-group discussion on interdisciplinary practice, followed by uniprofessional and then inter-professional case-based planning</p> <p>123 6 hours Postgraduate</p> <p>Clinical psychology, education, physical therapy and social work</p> <p>Widener University USA (Competitive) Mean 28 73% female; 27% male n/a n/a</p> <p>n/a</p> <p>n/a Student IPE can lead to improved understanding of collaboration, one's own and others' professional roles, but not to the same extent among older social work students</p>	

female)<sup>14,19,26,30,31,36,37</sup> and five described the age of the participants: the majority were under 24 years old.<sup>14,19,26,36,37</sup> None of the studies described the students' socio-economic or cultural backgrounds, despite referring to the importance of culture in interactions with patients,<sup>33</sup> and academic achievement and curriculum to students' perceptions of IPE.<sup>34</sup>

Of note are diverging findings related to student experience or maturity and outcome measures. Several studies found that more experienced students demonstrate greater improvements in understanding of one's own and others' roles, as well as improvements in attitudes towards IPE and teamwork.<sup>30,36,37</sup> One study found that first-year students' attitudes towards IPE declined after a semester-long, lecture-based multiprofessional intervention.<sup>35</sup> However, third-year students in the same study who had participated in the same intervention 2 years before the study demonstrated improvements in their perceptions of IPE after a small-group, teamwork-focused intervention. Another study found social work students, who were almost 5 years older on average than students in other participating health professions, consistently demonstrated much less favourable perceptions of IPE and teamwork.<sup>14</sup> It is not clear which factors – age, experience or social work – are associated with IPE activity effectiveness nor the nature of this relationship.

### Theories

Five studies used or alluded to theory to inform their IPE activity planning or analysis of results.<sup>19,27,30,32,37</sup> Most used pedagogical theories on strategies for effective health professional education, such as Allport's intergroup contact theory,<sup>37</sup> Benner's theory<sup>30</sup> and the constructivist learning theory.<sup>19</sup> Other theories included Witz's model of professional closure, which focuses on power and boundary work,<sup>32</sup> and Barr *et al.*'s<sup>27</sup> typology, which examines levels of change in IPE outcomes.

### Outcomes of IPE

None of the primary studies in this review reported longitudinal outcomes related to change in behaviour, improvements in patient or client health or administrator-level changes. Most studies focused on assessing the value or feasibility of their IPE activities among participating students. However, this was ascertained by using various process outcome measures that focused on attitudes towards and readiness for IPE or collaboration<sup>21,28,29,31,35–37</sup>; understanding of and respect for other professional

roles;<sup>14,20,21,25,26,28,30,32,34</sup> and improved teamwork or collaboration.<sup>19,25,26,31,33,36</sup> Other outcome variables included valued opportunities to gain professional practice<sup>19,33</sup> and improvements in content-specific knowledge, such as patient-centred communication.<sup>20,21,34</sup>

Barriers to success were reported in several studies: a short 2.5 hour intervention timeframe,<sup>25</sup> lack of reliable information technology<sup>29</sup> and students with limited experience or understanding of their professional role.<sup>30,36,37</sup> Perceived differences in power and status and poor participation rates among certain health professions were also described as challenges.<sup>25,26,28,32–34</sup> In the qualitative data, participants in one study described '...this ridiculous hierarchy...until we can change the "class" system in health care, this training will only go so far'.<sup>25</sup> Physiotherapy<sup>33</sup> and medical students<sup>32</sup> often dominated simulations, taking on leadership, not teamwork, roles. Their limited engagement hindered the effectiveness of the interventions.<sup>26,32</sup>

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## DISCUSSION

This is the first methodologically inclusive systematic review to examine university-based IPE in pre-licensure allied health curricula. It is also the first to prioritise context. The results indicate that IPE works, but our understanding of what works for whom in what circumstances is limited. This indicates a need to reconceptualise IPE and interprofessional socialisation as processes within a system rather than transferrable interventions, and in turn prioritise methodological approaches that allow us to understand the complexities of these processes.

The findings suggest that university-based IPE in pre-licensure allied health curricula is feasible and effective. Patient scenario interventions featuring group work in small teams, as opposed to lecture-based IPE, can lead to improved attitudes towards interprofessional interaction and teamwork, and improved understanding of health professional roles. Reporting and findings regarding duration are limited; however, interventions < 2.5 hours were described by participants as too brief.<sup>25</sup> Although we can conclude that IPE works, our understanding of the relationships between different modes of IPE and outcomes is limited.

Our understanding of the relationships between student characteristics, institutional characteristics and IPE outcomes is similarly limited.

The capacity for improvement in attitudes, collaboration and interprofessional understanding may be greater among students with more maturity or experience. Limited understanding of health professionals' roles may constrain the effectiveness of IPE interventions delivered early in allied health curricula. Findings regarding student age and experience, however, are inconsistent, with one study showing poorer outcomes among older students.<sup>14</sup> The mix and power dynamics across health professions in IPE interventions may also be significant, with physiotherapy and medical students described as dominant within patient scenario activities, undermining IPE effectiveness.<sup>32,33</sup> Overall, however, the extent to which conclusions can be made about what works for whom and in what circumstances is limited. Less than half of the studies included the students' age and gender. No studies explicitly described other aspects of students' characteristics, such as cultural or socio-economic backgrounds. Although occupational therapy and physiotherapy featured in many studies, health services management appeared in only one,<sup>27</sup> and podiatry was not included in any studies, despite arguments for the inclusion of podiatrists in IPE interventions.<sup>38</sup> The description of institutional contexts was similarly brief. Most studies evaluated programmes based in North America.<sup>39</sup> Although many Australian universities have developed interprofessional approaches to teaching pre-licensure health professionals,<sup>40</sup> our search did not locate any relevant Australian studies.

The results of our study depict a field of research concentrated on IPE intervention effectiveness, i.e. on 'what works'.<sup>41</sup> Most studies sought to answer research questions about feasibility and the extent to which interventions improved IPE readiness, attitudes and interactions. The short-term nature of these evaluations is not surprising given the time constraints of funding arrangements<sup>40</sup> and the tendency of IPE studies generally to focus on short-term improvements.<sup>42–44</sup> Few studies<sup>19,27,30,32,37</sup> incorporated theory into their analyses or conceptualised IPE as part of a broader system. Study designs were predominantly quasi-experimental, featuring pre- and post-intervention surveys. The use of qualitative methods was largely complementary. However, the relationship between participants and interviewers or focus group facilitators was not adequately described in several studies.<sup>21,25,27,31,33</sup> If student and lecturer relationships existed in these studies, full disclosure may not have occurred. Consequently, the feasibility of IPE has been established.

Yet, because varied IPE interventions are being implemented and evaluated in different contexts, contradictory findings have emerged.

The results gained in this study are not surprising, given the positivist paradigm dominating this field and its 'parent' fields: health science and medical education.<sup>45</sup> Allied health IPE research 'has been narrowly confined to the empirico-analytical paradigm, focusing on objectivity, measurement and statistical significance...and testing whether... consequences hold true by experiment and observation'.<sup>46</sup> Systematic reviews of IPE exclude all but the 'highest quality' evidence,<sup>2,39,47</sup> focus on generalisability<sup>48</sup> and assess studies that do not use randomised controlled trials, controlled before and after, or interrupted time series studies of lacking methodological rigour.<sup>42,45</sup> There is little reflection on whether these evaluations, which are appropriate for studies of rehabilitative techniques and treatments, are appropriate to IPE studies. At the same time, there are calls for more qualitative research in reviews of IPE.<sup>49,50</sup>

To move beyond this internal epistemological struggle slowing our capacity to understand how IPE leads to different short- and long-term outcomes among different students in different contexts, we argue for the reconceptualisation of IPE as a process rather than an intervention. Contradictory findings illustrate that there may not be a one-size-fits-all IPE intervention. Interprofessional education forms part of ongoing interprofessional socialisation processes within universities and health systems. Professional socialisation refers to 'the processes through which individual students learn to become members of a professional occupation...learning... knowledge and technical skills...and "craft" skills, norms, values and "professional" modes of conduct'.<sup>51</sup> Socialisation and induction into a professional or interprofessional role are complex processes that occur both in and outside of classrooms and clinics.<sup>9,42,52</sup> Re-imagining IPE as a process moves the research agenda away from 'single factor cause-effect thinking'<sup>53</sup> towards understanding how 'different types of IPE produce different types of outcomes within particular learning environments'<sup>25</sup> and how these processes lead to long-term behavioural and system changes.<sup>44,45</sup>

To further an IPE process research agenda, a broader approach to evaluation is needed. The realistic approach<sup>41,54</sup> to evaluation research, underpinned by a meta-epistemology, is one such approach that could be used. Realistic evaluation is



based on the premise that interventions 'never work indefinitely, in the same way, or and in all circumstances nor do they work for all people.'<sup>41</sup> In the quest to uncover 'what works for whom in what circumstances in what respects, and how',<sup>41</sup> realistic evaluation researchers examine  $M + C = O$ : the mechanisms (M) that will probably effect change, the contexts (C) of interventions, including participants, systems and settings, and the intended and unintended outcomes (O).<sup>41,54,55</sup> Interventions are part of a complex system<sup>55</sup> that requires a meta-epistemological approach where the need to balance postmodern relativism with constructivist subjectivity and positivist predictability is acknowledged and inductive, abductive and deductive modes of inquiry are valued as different points within a research cycle.<sup>53</sup>

Thus, we recommend that IPE researchers prioritise longitudinal understanding of relationships between IPE mechanisms and contexts within pre-licensure allied health curricula, using varied modes of inquiry, including in-depth qualitative methods, to unravel the complex processes involved in IPE. Furthermore, we, as IPE researchers, should value studies that adopt these approaches within systematic reviews<sup>22,46</sup> or, at minimum, be explicit about the epistemological assumptions underpinning critiques of methodological rigour.

In conclusion, we call for future IPE research to move beyond the aims of evaluation towards understanding processes. Recent review articles call for the evaluation of IPE interventions with consistent and valid tools.<sup>11,56,57</sup> We, however, argue that future research on IPE should first prioritise inductive understanding of the mechanisms behind interprofessional socialisation. Future research should adopt epistemologies appropriate to this end and employ research methods that allow for long-term exploration of this process. In doing so, researchers should be reminded to incorporate context (place, institution and country), background, socio-cultural factors and theory<sup>13,40</sup> into their data collection and analysis. Transferability across professions, institutions and countries should not be assumed.<sup>55</sup>

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#### SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

#### Appendix S1. Search Strategies.

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