2017-09-30

A Systematic Review of Reciprocal Peer Tutoring within Tertiary Health Profession Educational Programs

Swapnali Gazula
School of Nursing, Midwifery and Healthcare, Faculty of Health, Federation University Australia, Mt Helen campus, VIC 3353, Australia, s.gazula@federation.edu.au

Lisa McKenna
Nursing and Midwifery, Monash University, 10 Chancellors Walk, Clayton, VIC 3800, Australia, lisa.mckenna@med.monash.edu.au

Simon Cooper
School of Nursing, Midwifery and Healthcare, Federation University Australia, Gippsland campus, Churchill, VIC 3842, Australia, s.cooper@federation.edu.au

Penny Paliadelis
Executive Dean, Faculty of Health, Federation University Australia, Mt Helen, VIC 3353, Australia, p.paliadelis@federation.edu.au

A Systematic Review of Reciprocal Peer Tutoring within Tertiary Health Profession Educational Programs

Swapnali Gazula[a,*], Lisa McKenna[b], Simon Cooper[d], Penny Paliadelis[c]

[a]*School of Nursing, Midwifery and Healthcare, Faculty of Health, Federation University Australia, Mt Helen campus, VIC 3353, Australia*
[b]*Nursing and Midwifery, Monash University, 10 Chancellors Walk, Clayton, VIC 3800, Australia*
[c]*Executive Dean, Faculty of Health, Federation University Australia, Mt Helen, VIC 3353, Australia*
[d]*School of Nursing, Midwifery and Healthcare, Federation University Australia, Gippsland campus, Churchill, VIC 3842, Australia*

Abstract

Introduction: Reciprocal Peer Tutoring (RPT) is a form of collaborative learning that involves students of similar academic backgrounds experiencing interchanging roles of tutor and learner.
Purpose: Use of RPT has not been explored to the same degree as other forms of peer-assisted learning which may involve learners of different levels. The aim of this systematic review was to examine the role of RPT in health professions education in order to identify the benefits and challenges, as well as the best approach for its successful execution.
Method: A search of the literature between January 2005 and February 2016 was conducted using applicable electronic databases and snowball referencing searches. Methodological quality of the selected studies was ascertained with the use of the Critical Appraisal Skills Programme (CASP) checklist.
Results: Eight articles met the set inclusion criteria for the review. Within these it was found that RPT could potentially enhance cooperative learning, communication, metacognition and teaching skills apart from enhanced understanding of the topic under study.
Discussion: Whilst RPT has been found to have a positive impact upon learner experiences, further investigation is required around its use, particularly in assessing learning outcomes in health education programs.
© 2016 King Saud bin Abdulaziz University for Health Sciences. Production and Hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: Health professional education; Literature review; Peer assisted learning; Reciprocal Peer Tutoring; Systematic review

Contents

*Corresponding author. Tel.: +613 5327 6163.
  E-mail addresses: s.gazula@federation.edu.au (S. Gazula), lisa.mckenna@monash.edu (L. McKenna), s.cooper@federation.edu.au (S. Cooper), p.paliadelis@federation.edu.au (P. Paliadelis).

1. Introduction

1.1. Peer Assisted Learning (PAL)

Peer-assisted learning (PAL) is a form of collaborative learning described as the acquisition of knowledge and skill through active help and support among status equals or matched companions.[1] PAL is an umbrella term encompassing various forms of peer-assisted learning including peer teaching, peer learning, peer assessment, peer mentoring and peer leadership.[1] Whilst distinct from each other, all variations have some commonalities such as similar discipline groups, mutual interaction and non-professional teaching roles.[2]

Earlier work in the field has been undertaken in primary and secondary schools [3] and is increasingly being disseminated within higher education healthcare programs.[4,5] Incorporating peer teaching within professional curricula helps to meet expectations of health professional competency standards related to teaching others.[5] PAL is not a new innovation but it is suggested that despite its ancient existence, it is an underused, yet highly prospective resource in higher education.[6]

1.2. Reciprocal Peer Teaching: a form of PAL

Reciprocal Peer Tutoring (RPT) is one form of PAL specifically involving structured switching of tutor-tutee roles amongst individuals of the same academic-year level.[7,8] Numerous systematic reviews have been conducted to gain an understanding of PAL within medical,[9,10] nursing,[11] medical and allied health education programs [2] as well as undergraduate health sciences education,[12] however none have focused on RPT specifically.

Initial documented evidence of RPT use was found in the 1970s with primary school children in USA, where fellow classmates interchanged roles of learner and tutor to study remedial reading facilitated by undergraduate teacher trainees.[3] Benefits to the approach have been identified within tertiary education[13] including improved understanding and retention of content,[7,13] better skill retention,[14] improved communication[7,15] and greater self-direction.[16] In a study with language students within Ireland,[17] RPT was found to be the catalyst for improving individual responsibility and accountability, as well as increased group solidarity. Due to the nature of interchanging roles of learner and teacher, RPT enables students to simultaneously learn while contributing to their peer's learning, sharing mutual experiences and reducing power differentials. Academics from various fields including medicine,[15] physiotherapy,[18] language learning,[17] teacher training,[19–21] mathematics [22] and information technology [23] have successfully embraced the use of RPT. However, despite identified merits, RPT is not widely popular in health professions education.[7]

Notably, some authors[24] highlight that conversely to being a highly valuable and established learning asset in higher education, RPT remains underutilised.

One of the reasons for the limited focus on RPT is prevalence of disagreement on peer learning terminologies. It is important to note that despite sharing commonalities, PAL forms are distinct from each other.[2] Although sounding similar, Reciprocal Peer Tutoring and Reciprocal Teaching are different,[25] where the latter is a phenomenon that involves reciprocating instructor roles between expert professional teacher and novice learner. These authors also indicate the applicability of Reciprocal Teaching to cross-age peer tutoring settings, thereby linking Reciprocal Teaching with Near Peer Teaching (NPT) where a learner who is typically junior is tutored by a senior student within the same program of education.[26] NPT is also referred as fixed peer tutoring,[21] while others [27] refer to NPT as PAL, despite being a form of PAL. Yet others [16,19] denote RPT as Reciprocal Peer Coaching. Given the recency of these articles, prevalence of disagreement about PAL nomenclature can be reasonably inferred.

Given the variety of terms used for defining RPT, it is imperative to clarify the definition for this review. Hence, in this systematic review, RPT is defined as a form of peer-assisted learning where students from similar educational backgrounds, that is, in the same year of study, alternate roles of tutor and learner to meet identified learning objectives. This definition was selected due to its alignment with the pioneering description of RPT.[3]

This systematic review sought to explore the use of RPT within undergraduate and postgraduate health education programs, aiming to identify benefits and challenges reported from peer-reviewed research studies. The review aimed to examine the literature in relation to RPT and to present the findings in relation to tertiary health profession education programs globally, in order to inform curricula and the manner to best implement RPT within undergraduate health programs.

The specific research questions were:

1. What are the reported challenges of utilising Reciprocal Peer Teaching (RPT) as a formal teaching-learning strategy within tertiary health education settings?
2. What are the reported benefits of RPT as a formal strategy within tertiary health education settings?
3. How can RPT be implemented successfully as a formal teaching-learning strategy within undergraduate health sciences?

2. Methods

2.1. Design

A comprehensive search strategy was used to identify potentially relevant published research studies, using quantitative, qualitative or mixed methods, which met the inclusion criteria. Narrative reviews, non-peer reviewed articles and editorials were excluded from the search. Articles were searched within a period of just over 10 years from January 2005 to February 2016.

2.2. Search strategy

Article searching was performed electronically to locate peer reviewed articles using the search engine Google Scholar and electronic databases including EBSCO host, Taylor and Francis, JSTOR, ScienceDirect, Wiley Online Library, Oxford, Emerald, Cambridge Journals, Springerlink, British Medical Journals, and Cumulative Index to Nursing and Allied Health Literature (CINAHL). Additionally, snowball sampling was conducted through manual searching of reference lists from selected papers. Key search terms used were: 'Reciprocal Peer Tutoring', 'Reciprocal Peer Teaching', 'Reciprocal Peer Coaching', 'Peer Assisted Learning' individually, and in combination with 'Higher Education' and 'Health' by subject.

2.3. Inclusion and exclusion criteria

Inclusion criteria included classroom, laboratory, or clinical settings within undergraduate or postgraduate health disciplines, published in English between January 2005 and February 2016. The manner in which RPT was carried out included students of similar levels alternating roles of tutor and learner to meet identified educational outcomes. It was essential to have the conforming RPT definition clearly articulated within the study in order to be included within this review. Outcome criteria/measures were not specified. Exclusion criteria comprised non-peer reviewed articles, non-empirical studies, non-health science studies and those outside of the definition of RPT.

2.4. Assessment of study quality

All articles meeting the inclusion criteria were included in this review, regardless of their selected level of evidence as RPT based studies are inclined to use study designs, such as observational, case series and cohort studies which are considered inferior in the grading of evidence.[28]

Quality of each article was evaluated using criteria for cohort and qualitative studies from the Critical Appraisal Skills Programme (CASP).[29] While CASP is a tool used to assess quality of articles within systematic reviews, there could be other quality appraisal tools used in adjunct with it.[30] However, given the types of articles included in this review, no other quality appraisal tools were applied apart from CASP. The authors recognise that despite not being of high quality, all articles have been included within this review due to the scant published literature around RPT in health professions education. Two independent assessors individually assessed the study aims, research design, sample selection as well as recruitment, ethical considerations in sample recruitment, consideration to researcher and participant relationship, rigorous analysis and discussion of results. Where consensus was not reached, a third expert would have been consulted, however this was not required. Studies often neglected to identify ethical issues, assessment tool development and interrelationships between participants and researchers. Only three [31–33] out of the eight studies clearly indicated that ethical approval had been formally gained. Nonetheless, one study [31] did not clarify if the facilitators of focus groups, who were also year coordinators, were involved in direct teaching of the participants. Some studies[7,15] asserted the effectiveness of RPT based upon positive perspectives from participant and academics, but did not clearly identify the limitations in making these claims.

3. Results

3.1. Overview of studies

Based upon the combination of the primary search terms, 31 articles were identified in higher education. Sixteen eligible studies were identified after eliminating narrative reviews, non-health education articles and non-peer reviewed journal articles. Abstracts and full papers were then examined to ensure that they satisfied the inclusion/exclusion criteria. The definition of RPT was carefully scrutinised which resulted in the exclusion of eight studies with non-conforming definitions, leaving a final collection of eight articles for inclusion (see Fig. 1). These were two qualitative, one quantitative and five studies using mixed methods. The small number of articles arising from this search demonstrates that RPT has not been explored to a great extent in recent years.

3.2. Study designs, participant characteristics, theories and aims

As shown in Table 1, questionnaires, surveys and focus group interviews were used to capture qualitative data. Four studies[13,15,32,33] accessed students' course grades, in which one[33] additionally utilised the Tutor Intervention Profile, Likert Scales, assessment checklist and academic scores to elicit quantitative data. Observations through video-recording were conducted by some[18] to obtain a percentage success of performance. Most of the studies were conducted with undergraduate students ($n=7$), out of which four[7,13,16,31] chose first year students, two[32,33] selected third years and one study [18] has not specified the precise year level of their undergraduate participants. Only one was conducted with postgraduate participants.[15] Four articles were identified from the USA, two from the UK, one from South Africa and another from Bahrain. The disciplines included medicine, osteopathy, physical education and physiotherapy (Table 2). Since physical education involves studying physiology and human anatomy, it was included as a health discipline within this review. Three out of the eight studies used theories to support their study as a framework. One researcher[16] used both
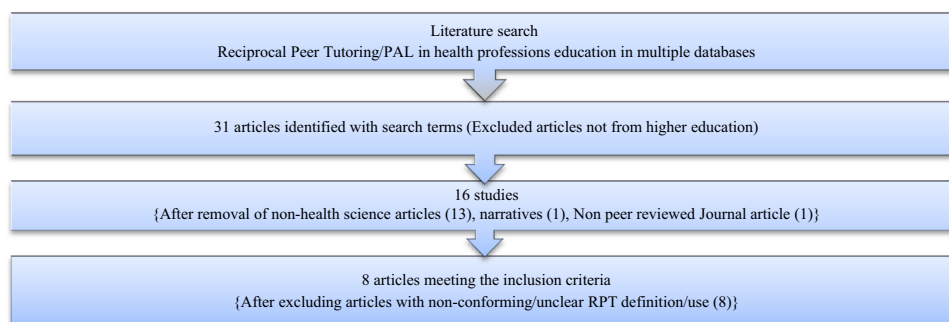

Fig. 1. Flowchart of literature search process.

Table 1
Characteristics of the selected studies.

Author, Year, Place of Study	Study design	Participants	Theory used	Study aim
Asghar, 2010, UK	Four semi-structured individual interviews and a Focus group interview	First year physiotherapy students ($n=12$)	Cognitive development theory, Vygotsky's theory of zone of proximal development	To elicit student perceptions of the Reciprocal Peer Coaching process as a formative strategy
Bennett, O'Flynn, Kelly, 2014, UK	Activity System Analysis Qualitative approach, Three focus groups, Two open ended questions,	First year medical students undertaking full time hospital placement ($n=115$)	Activity theory	To determine how PAL transfers to the clinical environment
Bentley and Hill, 2009 USA	Descriptive Survey 15 question using 5 point Likert Scale and one open ended question	First year medical osteopathy students ($n=297$)	None	Assess RPT as a teaching method, compare it with other methods and make recommendations for future curricular changes
Hennings, Wallhead and Byra, 2010, USA	Didactic research methodology using Quasi ethnographic framework Observations, Semi structured interviews	Undergraduate climbing physical activity class students ($n=4$) Student year level is not listed within the article.	Didactics	To address the questions: 1. What (mis)alignment existed between the content intended to be taught by the teacher, and the content actually learned by the participants? 2. What factors operated within the didactic milieu of the reciprocal style episodes to shape the content actually learned by participants?
Kassab, Abu-Hilej, Al-Shboul and Hamdy, 2005, Bahrain	Experimental study Tutor Intervention Profile using 5 point Likert scale Student self-assessment checklist on 5 point Likert scale Tutor evaluation of individual student performance by using assessment checklist Student evaluation of their group function using scale of one to four Academic scores Open ended questionnaires for student perception	91 third year medical students 5 groups each of faculty led and student led tutorials	None	1. To assess if students acting as tutors acquire similar skills as faculty tutors 2. Assess difference in academic performance in students taught by faculty and tutors 3. Gain perceptions of students about peer tutoring

Krych et al., 2005, USA	Descriptive Survey 13 item debriefing survey using 5 point Likert scale Open ended questions seeking feedback	First Year medical students ($n=44$)	None	Examine acceptability of RPT in learning anatomical concepts and communication skills
Scott and Jelsma, 2014, South Africa	Quasi Experimental Test scores 40 items true/false test to elicit knowledge about health conditions Questionnaire to rate satisfaction about the sessions	Third year Physiotherapy students ($n=36$) One educator and three peer-led groups	None	1. Compare student test scores following peer led and clinical educator led sessions 2. Elicit student satisfaction for preferred method of learning
Youdas et al., 2007, USA	Descriptive survey 12 item instrument using 5 point Likert scale with three open ended questions	Doctor of Physiotherapy Students ($n=27$)	None	1. Assess perceived usefulness of RPT as a method for teaching-learning human anatomy in laboratories 2. Determine if exposure to RPT during a semester had an effect on student course grades

Table 2
Reciprocal Peer Tutoring details within the selected studies.

Article	Use of RPT as Supplemental/ Mainstream activity	Setting of RPT	Impetus to initiate RPT	Facilitated by faculty/ representative	Tools used to capture data	Incentive offered to students for participation	Participants having previous experience with RPT
Asghar, 2010	Mainstream: Students were interviewed after experiencing reciprocal peer skills assessments	Laboratory	Combat alternative method to the stressful and time consuming summative skills assessments	Yes	Individual interviews and focus group interviews	None	No
Bennett et al., 2014	Mainstream: Clinical case presentation	Clinical setting	To explore the transferrable nature of PAL from laboratory to clinical settings	No	Qualitative feedback about RPT sessions and focus groups interviews	None	No
Bentley and Hill, 2009	Mainstream Gross anatomy	Anatomy laboratory	Combat increased students numbers and reduced resources – qualified educators and cadavers.	Yes	Course grades Surveys and opinions	Lesser faculty: student ratio for dissecting during half the term.	No
Hennings et al., 2010, Wyoming, USA	Unclear what learning opportunities were given to the remainder 14 students excluded from this study: Indoor climbing	Field work	To understand how RPT influences the content to be taught and what is actually learnt	Yes	Video recording and semi structured interviews	None	Yes
Kassab et al., 2005, Bahrain	Mainstream: Health conditions using problem based learning in	Classroom	Conserving faculty resources and promoting student skills of leadership, analytical thinking and evaluation	Yes	Tutor Intervention Profile, Likert Scale and Self-assessment checklist.	None	No
Krych et al., 2005	Supplemental Gross anatomy	Anatomy laboratory	To explore effect of RPT on aspects fostering professionalism	Yes	13 item debriefing questionnaire with several open ended questions	Each participant got to practice the skill three to four times.	No
Scott and Jelsma, 2014, Cape Town	Mainstream: Health conditions	Clinical	Increasing student numbers and need to give a broader scope of practice	Yes	Student test scores Questionnaire to seek student satisfaction about peer led and educator led sessions	None	No
Youdas et al., 2007	Supplemental	Dissection laboratory	Authors wanted to explore foremost use of RPT in physical therapy education	Yes	12 item survey with 4 open ended questions	As peer teachers, students received guidance and rehearsal with faculty prior to teaching their peers.	No

Table 3
Results of the selected studies.

Article	Academic benefits from RPT	Generic benefits from RPT	Challenges encountered	Recommendations	Limitations of study
Asghar, 2010	Inculcation of self-regulation to become autonomous learners. Self-regulation is affected by motivation, self-efficacy, time management, goal setting, meta-cognition and associated emotions.	Collaborative learning	Reluctance by students to be a part of the group. Overlooking students who were reluctant to participate in the group.	Being aware of students reluctant to participate. Consider educational needs of diverse students by providing opportunities to engage in variety of assessments.	None listed
Bennett et al., 2014	None	None	Students preferred learning from expert (faculty member) as opposed to from their peer. Students found it difficult to give negative feedback to their peers. Lack of enthusiasm for RPT as students were task oriented focussing to succeed in exams.	Before designing RPT it is important to know how students learn. RPT should be undertaken as a supplemental activity instead of replacing traditional learning. Integrate RPT within the curriculum to recognise it Include RPT in assessments. Have faculty or representative present during the RPT which may influence student engagement with RPT.	No faculty vetting of topics covered in RPT which were selected randomly on clinical placements. While authors acknowledge students had no training in teaching skills; they assert that this did not pose any tensions in their study.
Bentley and Hill, 2009	Perception of enhanced learning of topic. More efficient use of time.	Experience of collaborative learning	Lack of previous teaching experience. Some individuals did not perform to their group's standards.	Orientation to 'tips and tricks' as novice teacher. Weekly assessments to propose solutions for improving group dynamics.	Grade differences (MCAT and GPA) of the incoming classes were not considered due to unavailability. Both class groups evaluated may have had some extraneous variables affecting scores. Not all students responded to surveys leading to possibility of under-representation of the student views.
Hennings et al., USA	Improved performance while learning basic tasks.	Enhanced co-construction of knowledge suggestive of cooperative learning.	Participants were unable to construct complex tasks resulting from deficient observation from peer tutors.	Selection of teaching style should give due consideration to learner's stage of motor development and ability of learner to comply with task. RPT can be used in relatively simple content an when participants have sufficient experience in sharing feedback.	Self-reflection on performance through the simulated video recall done in this study, is not a usual hallmark of RPT.

Table 3 (*continued*)

Article	Academic benefits from RPT	Generic benefits from RPT	Challenges encountered	Recommendations	Limitations of study
				There could be a faculty-initiated practice style while dealing with difficult content before commencing with RPT style of learning.	
Kassab et al., 2005, Bahrain	No changes in student scores when compared between student-led and faculty-led tutorials.	Relaxed tutorial environment, better perception of decision making and support.	Lack of experience and bias towards fellow students led peer tutors allocate higher scores to peer learners.	Suggest Near Peer Tutoring over RPT. Special tutoring training to be given before students undertake tutoring role.	Examinations scores allowed for assessing the knowledge scores only as opposed to the interaction process.
Krych et al., 2005	Increased understanding and retention of topic learnt.	Experiencing improved communication and teaching skills.	Students were anxious about time management. They found it overwhelming to learn, assimilate and teach new material same day.	More preparation time. Have three to six specific objectives listed for each RPT session.	No objective measures carried out to quantify the increased understanding and retention fo the topic.
Scott and Jelsma, 2014, South Africa	No significant differences in mean scores of both peer led and faculty led groups. However slightly high scores in sections taught by students than clinical educators.	Not discussed	Students preferred to be taught by clinical educator due to inexperienced peer tutors.	None	Not all students within the study got an opportunity to be a peer tutor due to some sessions being taught by clinical educators.
Youdas et al., 2007	Improved understanding and retention of topics. Improved median grades for the anatomy course.	Improved oral communication skills Increased confidence to teach Promoted collaborative learning.	Some group members were inattentive. Not enough time to master material before teaching it to peers	Reducing amount covered in every laboratory session. No recommendations for improving group dynamics.	Absence of randomised student sampling. A pre-test post-test of two group design could be done instead. Small sample size of n=27 to assess perceived usefulness of RPT. Survey instrument not tested outside the given setting. When claiming the improvement in median grades, no consideration to variables like psychosocial factors that could affect the scores of the two independent student groups, besides RPT intervention.

cognitive development theory and Vygotsky's social development theory while two other studies used activity theory[31] and didactics.[18] Study aims encompassed exploring student perceptions,[15,16,33] effect on academic performance,[15,32,33] factors affecting learning content,[18] examine RPT as a teaching method,[13] application in clinical environment,[31] acquisition of teaching [33] and influence on communication skills.[7]

3.3. The use of RPT

As seen in Table 2, most authors [13,16,31–33] chose to utilise RPT as a mainstream teaching-learning activity, while others [7,15] chose to utilise it as a supplemental strategy. Some [18] employed RPT with four purposive samples, however there is no clarification if the same teaching-learning activity was provided for the remaining 16 students enrolled in their course. It could be considered that RPT was used as the mainstream form of activity since there was no mention of any other form of educational stratagem.

Stimulus for using RPT ranged from exploring application in physiotherapy education,[15] fostering professionalism,[7] identifying links between what was taught and actually learnt,[18] as well as transference of learning to clinical settings.[31] RPT was used as a replacement for stressful summative skill assessments.[16] On the other hand, some reseachers[13] sought to use the approach to combat increased student numbers and diminished educational resources in the form of dissection cadavers and qualified educators. Yet others [32,33] adopted the use of RPT due to similar challenges[13] but additionally explored elements such as enhancing student practice and developing their non-technical skills.

Settings for RPT were mainly laboratories, clinical settings or fieldwork. Most studies were facilitated by a faculty member or tutor, except one [31] which used RPT with students with no faculty presence. Two studies [32,33] had peer tutors closely supported by faculty members in preparing the content to be taught before tutoring their peers. Although most of the studies included participants without prior experience of RPT, some [18] conducted their study with individuals who had previous experience with RPT; the details of this are not elaborated within their study.

Participants from the studies conducted within dissection laboratories received incentive for involvement by getting extra time and opportunity to practise skills,[7] or guidance and rehearsal with a faculty member.[15] They also experienced better than normal faculty-student ratios for half of the academic term,[13] thereby providing more opportunities for faculty interaction. The remainder of the studies did not offer any identified incentives for participation in RPT sessions.

3.4. Benefits gained from RPT

Identified benefits gained from the use of RPT were classified into discipline-specific and generic benefits (Table 3). While discipline-specific benefits comprised discipline knowledge and skills specifically required by the curricula, generic attributes denote transferrable skills, which are different to discipline-specific skills.[34] The transferable skills gained by implementing RPT within this review can be synthesised as improved communication,[7,15] enhanced teaching skills,[7] independent learning and problem solving [13,16] as well as learning and working collaboratively.[13,15,16,18,33] Scott and Jelsma[32] did not identify any transferrable skills within their student cohorts.

Discipline-specific benefits included enhanced understanding and retention of the topic,[7,13,15,32] improved course grades [15] inculcation of self-directed learners [16] and improved knowledge and skills.[18] There was no change in the student scores of peer-led or faculty-led groups.[33]

Claims that RPT was effective in understanding concepts and communication skills[7] were based upon student perspectives and there were no supporting objective measures. Increase in the median scores as a result of RPT was found by comparing grades of students who had experienced RPT with those who were taught traditionally during the previous year.[15] While these researchers admit a limitation of their study design; they did not acknowledge that variables like psychosocial factors could influence academic performance of students.[35] Thus some assertions made about the effectiveness of RPT could be questionable as a broad spectrum of factors that could affect the results have not been considered. Most studies were inclined to rely on the perspectives of students as well as academic staff and have not measured objective changes as a result of RPT. This warrants for further research to objectively measure changes of actual learning.

3.5. Challenges encountered, limitations and recommendations

Students were reported to be anxious and overwhelmed when asked to learn and teach new material on the same day.[7] Some participants reported lack of previous teaching experience,[13] insufficient time to

master content before teaching it to peers,[15] and inability to construct complex tasks due to deficient observations by peers for diagnosing in-task errors, resulting in lack of timely feedback to rectify errors.[18] Some peer tutors assigned more marks to their peer students due to lack of experience or bias.[33] There were also reports of challenging group dynamics and individual differences in learning pace.[15,16] Providing negative feedback was seen as confronting for some participants,[31] while it was reported that some preferred to learn from an expert academic, rather than from their inexperienced peers.[31,32] It is noteworthy that all the seven studies conducted with undergraduate students, generally encountered difficulties by participants like fear and anxiety to embrace RPT, particularly in the first year cohorts. On the contrary, post graduate students [15] generally embraced RPT. This finding possibly highlights the year level of students selected for RPT to be considered for senior year level rather than first year students.

Given the variety of challenges encountered, all studies suggested recommendations for future research. These ranged from allocating more time and specific objectives for every RPT session,[7] orienting participants with preliminary teaching skills[13,33] and reducing teaching content covered in every session.[15] Some[13,16] highlighted the need to be aware of individuals who were reluctant to participate and consider the diversity of educational needs of students. Further suggestions included consideration of teaching styles to suit learner abilities and developmental stage.[18] Some authors[13] suggested RPT is best carried out as a supplemental and facilitated educational strategy, while others [33] recommend replacing RPT with NPT as they identified peer tutors found difficulty in analysing the problems within the problem-based learning program, thereby emphasising previous learnt experience vital to teach peers. On the other hand, they also acknowledge that special training for becoming tutors is imperative for students of the same year level to get successful student learning experience. This was supported by the findings of a study [36] which found training yielded better student learning, rather than spontaneous peer interactions in high school students. RPT had a positive impact on student learning experience.[33] Issues with group dynamics was reported as one of the challenges in their study but did not make any recommendations for overcoming it.[15] Limited resources such as finances, clinical sites and educators were recognised as challenges to optimise student learning on placements.[32] Therefore ascertaining the efficacy of peer teaching with educator teaching in small group settings within clinical placements was proposed.[32]

While most discussed limitations of their studies, three[7,16,32] did not identify any. The authors of this systematic review identified a limitation in one of these studies[32] as not all students had an opportunity to be peer tutors due to some sessions being scheduled to be run by clinical educators. Despite the fact that all students did not get the opportunity to be peer tutors, this study was included within this review due to its participants belonging to the same year and somewhat reciprocal nature of student interactions. Although some authors[13] did not find any significant differences in comparing course grades of a group that used RPT with another that did not, they did not consider differences between Grade Point Average and Medical College Admission Test Scores due to unavailable data. These authors also acknowledged the voluntary nature of student responses towards RPT leading to under-representation of student views. Others [15] viewed absence of randomised student sample selection technique to be a study limitation. They proposed pre-test post-test two-group design instead of their descriptive survey. Moreover, the tool used to collect data was not tested outside their setting so may not have been valid and reliable. In one study,[31] the limitation was identified as faculty not vetting topics included in RPT, instead topics for RPT were randomly selected from placements which varied according to the patients. These authors' recognised students' lack of teaching skills as a limitation, whereas on the other hand they asserted that this information did not lead to participant anxiety in their study. Yet others [18] admitted using a different approach for using RPT in their study by incorporating self-reflection by students on their performance using simulated video recall, which was not a usual hallmark of RPT use. One study [33] acknowledged use of examination scores but limited them to assessing knowledge only and not the student interaction process.

4. Discussion

The purpose of this systematic review was to scrutinise the benefits and challenges of RPT in health professional education. It also aimed to explore how RPT could be implemented successfully within tertiary health education settings. Formal PAL is gaining increasing popularity internationally.[10]

4.1. Need for RPT

One impetus for RPT use has been increasing student numbers coupled with sparse teaching resources,[37] but also experimenting with other gains

such as development of leadership, teaching skills and professionalism.[7,38] The current review also found RPT helped in attainment of metacognitive regulation, which is a set of self-regulatory skills to actively coordinate self-learning. Recent findings [39] also support that RPT is a promising strategy to promote metacognitive regulation. In this study, a quasi-experimental pre- test post-test design was applied by introducing eight RPT sessions with first year undergraduate educational science students. Think-aloud and verbal protocols were used to measure students' metacognitive regulation. Their findings revealed increased metacognition of students through RPT. Metacognition is viewed to be crucial for developing readiness and competence for academic life,[40] as well as for career development.[34] It has been emphasised [26] that despite numerous documented benefits of various PAL forms, it has not been formally integrated into higher education curricula.

4.2. Role of the academic in the use of RPT

Whilst there are merits in applying RPT, the facilitating role of academics remains crucial in ensuring support and guidance to participants which is also seen in other forms of PAL, such as NPT.[11] Being in the same year level can lead to lack of direction [37] and hence it is important to give thought to the manner in which RPT will be carried out. If peer tutoring has replaced the instructor role, caution needs to be given for using structured peer interactions as a means to augment the educator's role, rather than substituting it.[2]

4.3. Aspects to be considered when implementing RPT

There was one study [31] which found RPT use to be challenging and discovered that students from heterogeneous backgrounds preferred to learn from faculty members as opposed to their peers. The two student cohorts from their study comprised a diverse group: one having prior degrees and the other school leavers with no prior degrees. Several reasons can be outlined for this, including timing and the complex nature of the task for a heterogeneous group with no faculty support despite being undertaken as a mainstream activity. This study also underscored the findings[11] that students could feel unprepared and apprehensive for being responsible for their peers' learning. A recent literature review,[41] found that academics must be mindful that disparate student backgrounds result in different learning styles and preferences. Whilst diversity of student cohorts can be perceived as a strength,[42] dissimilar backgrounds and lack of previous

interactions within the group may perhaps result in awkwardness in providing peer feedback. It cannot be assumed that simply pairing individuals for instructional purposes will yield productive results.[3] Compulsory peer tutor training and support in executing RPT is of paramount importance.[25] Necessity of careful planning and organising will enable good quality student interactions.[43] Prior to introducing a new educational concept, due consideration needs to be given to the complexity of learning environment and tasks undertaken[44] which echoes the findings that students tend to be unsuccessful in performing complex tasks.[18] Using a framework for planning the peer interactions will enable a systematic approach by carefully considering a series of questions. These queries relate to alignment of the peer learning activity with curriculum, assigning responsibilities to academics for specific planning areas, role of staff, piloting the project, timelines and required funding as well as projected outcomes could be beneficial for smooth implementation.[45]

A recent study [38] compared traditional teacher instruction to RPT in the anatomy laboratory. First year medical students ($n = 227$) received traditional teacher-directed instruction in human anatomy dissection during the initial half of their first semester. RPT was introduced in the second half of first semester where student groups of fifteen per table dissected cadavers. To ensure equal opportunities, the head of department prepared a schedule to ensure every student was able to experience peer tutor and peer learner roles. Two students were peer tutors daily and received a forty-five minute pre-laboratory session with faculty to review their dissection knowledge and skills. Following this, they performed peer tutoring for ninety minutes by executing the dissection session. The remaining 30 min of the two-hour session was then utilised by the faculty member to clarify questions from the group. Students agreed through survey that RPT enhanced their interest, enthusiasm and engagement during the anatomy laboratory sessions. These findings were similar to faculty responses who used an observational tool to assess student collaboration, professionalism and teaching. These authors have clearly articulated the manner in which RPT was instigated, recognising the value of planning and academic support during the process. It also brings to light the potential of RPT in learning hands-on motor tasks. This study was not included within this review as it was outside the selected period, emerging after analysis was completed.

4.4. Lack of consistency in RPT terminology

There is a strong prevalence of lack of consistency in terminologies used to describe RPT [11] found in this

systematic review.[16,31] RPT is a form of PAL and is distinct due to the reciprocation of tutoring role among individuals of similar educational backgrounds.[3] This review has found potential equivalence in student outcomes from RPT and NPT, although this requires further exploration. A number of studies have been conducted on NPT and academics continue to use it over RPT.[9] However few studies have been conducted on RPT, which warrants further exploration as not much is known about this enigmatic teaching-learning strategy with potential curriculum benefits.

4.5. Paucity of research that explores RPT use in health professions education

Within tertiary health education, placements form a vital role to consolidate knowledge with practical exposure [2] which could have scheduling implications. Timetabling for NPT can be challenging [26] potentially due to involvement of different year level students. RPT, on the other hand, could possibly eliminate this challenge by having participants from the same year level. This however, requires further testing. It is noteworthy that none of the studies implementing RPT included within this review originated from the disciplines of nursing, midwifery or paramedicine. Applicability of RPT in various learning settings, including classroom, laboratories and clinical placements could be investigated.

5. Limitations

This review included studies published in English language only so studies published in other languages may have been missed. There are challenges in reviewing RPT within health education, which is a relatively new topic in the field. Whilst effort was made in manually checking the grey literature, prevalence of confusing terminologies by academics to describe RPT may have led to missing relevant articles through the search terms used for this review. As an example, an article included within this review,[33] has not explicitly mentioned RPT despite having utilised it to study problem-based learning in medical curriculum. Sometimes, key information about the manner in which RPT was effected was not well described in some of the included articles thus preventing a comprehensive representation of RPT. Selection and inclusion of studies was done to best exemplify the use of RPT within health education in the tertiary sector. All articles meeting the inclusion criteria have been included in this review, despite not qualifying as high quality due to the dearth of literature around RPT within health sciences in recent years.

There needs to be further research conducted to examine RPT in other disciplines and settings. Cost benefit analysis using this approach can be studied to optimise student learning outcomes. Comparison of RPT and NPT could also be undertaken. Furthermore, objective measures to quantify the effect of RPT could be applied. Academic and student perspectives towards RPT experience could be investigated in depth, as well as examination of this strategy in meeting educational outcomes within varied disciplines.

6. Conclusion

This review has explored used of RPT within health science education. A range of discipline specific and generic benefits could be gained through this educational approach. Meticulous planning and preparation of participants for tutoring roles is essential to ensure they have a positive learning experience from RPT. Due consideration to the year level of participants could also be beneficial for optimal outcomes. Although students remain the active participants, academic facilitation is beneficial to ensure ongoing support and monitoring, especially if participants are new to this educational stratagem. RPT remains a promising educational tool, awaiting exploration within tertiary health science educational programs.

One sentence bios

Swapnali Gazula is Nursing Lecturer at School of Nursing Midwifery and Healthcare, Faculty of Health, Federation University Australia, Australia.

Lisa McKenna is Professor of Clinical Nursing (Critical Care) at School of Nursing and Midwifery, Monash University, Australia.

Simon Cooper is Professor of Acute/Emergency Care (Nursing) at School of Nursing Midwifery and Healthcare, Faculty of Health, Federation University Australia, Australia.

Penny Paliadelis is Professor and Executive Dean of Faculty of Health, Federation University Australia, Australia.

Disclosure

References

1. Topping K. *Peer Assisted Learning: A Practical Guide for Teachers*. Northampton, MA: Brookline Books; 2001.

2. Henning JM, Weidner TG, Marty MC. Peer assisted learning in clinical education: literature review. *Athl Train Educ J* 2008;3(3): 84–90.

3. Allen AR, Boraks N. Peer Tutoring: putting It to the Test. *Read Teach* 1978;32(3):274–278.

4. McKenna L, French J. A step ahead: teaching undergraduate students to be peer teachers. *Nurse Educ Pract* 2011;11:141–145.

5. Williams B, Wallis J, McKenna L. How is peer-teaching perceived by first year paramedic students? Results from three years. *J Nurs Educ Pract* 2014;4(11):8.

6. Williams B, Olaussen A, Peterson EL. Peer-assisted teaching: an interventional study. *Nurse Educ Pract* 2015;15(4):293–298.

7. Krych AJ, March CN, Bryan RE, Peake BJ, Pawlina W, Carmichael SW. Reciprocal peer teaching: students teaching students in the gross anatomy laboratory. *Clin Anat* 2005;18(4): 296–301.

8. De Backer L, Keer H, Valcke M. Exploring the potential impact of reciprocal peer tutoring on higher education students' metacognitive knowledge and regulation. *Int J Learn Sci* 2012;40(3): 559–588.

9. Yu TC, Wilson NC, Singh PP, Lemanu DP, Hawken SJ, Hill AG. Medical students-as-teachers: a systematic review of peer-assisted teaching during medical school. *Adv Med Educ Pract* 2011;2:157–172.

10. Burgess A, McGregor D, Mellis C. Medical students as peer tutors: a systematic review. *BMC Med Educ* 2014;14(1).

11. Stone R, Cooper SJ, Cant R. The value of peer learning in undergraduate nursing education: A systematic review. *ISRN Nurs* 2013:1–10.

12. Secomb J. A systematic review of peer teaching and learning in clinical education. *J Clin Nurs* 2008;17(6):703–716.

13. Bentley B, Hill R. Objective and subjective assessment of reciprocal peer teaching in medical gross anatomy laboratory. *Anat Sci Educ* 2009;2(4):143–149.

14. Iserbyt P, Elen J, Behets D. Instructional guidance in reciprocal peer tutoring with task cards. *J Teach Phys Educ* 2010;29(1): 38–53.

15. Youdas JW, Krause DA, Hellyer NJ, Hollman JH, Rindflesch AB. Perceived usefulness of reciprocal peer teaching among doctor of physical therapy students in the gross anatomy laboratory. *J Phys Ther Educ* 2007;21(2):30–38.

16. Asghar A. Reciprocal peer coaching and its use as a formative assessment strategy for first-year students. *Assess Eval High Educ* 2010;35(4):403–417.

17. Lui W, Devitt A. Using reciprocal peer teaching to develop learner autonomy: an action research project with a beginners' Chinese class. *Lang Learn High Educ* 2014;4(2):489–505.

18. Hennings JM, Wallhead T, Byra M. A didactic analysis of student content learning during the reciprocal style of teaching. *J Teach Phys Educ* 2010;29(3):225–243.

19. Trautwein B, Ammerman S. From pedagogy to practice: mentoring and reciprocal peer coaching for preservice teachers. *Volta Rev* 2010;110(2):191–206.

20. Kneen J, Pattison E. 'Qui Docet Discet'(Those who teach learn)– how peer teaching can help prepare student teachers for the classroom. *Teach Adv Netw J* 2012;4:2.

21. Miravet LM, Ciges AS, García OM. An Experience of Reciprocal Peer Tutoring at the University. *Procedia-Social Behav Sci* 2014;116:2809–2812.

22. Tsuei M. Using synchronous peer tutoring system to promote elementary students' learning in mathematics. *Comput Educ* 2012;58(4):1171–1182.

23. Shadiev R, Hwang W, Yeh, S, et al. Effects of unidirectional vs. reciprocal teaching strategies on web-based computer programming learning. *J Educ Comput Res* 2014;50(1):67–95.

24. Muñoz-García MA, Moreda GP, Hernández-Sánchez N, Valiño V. Student reciprocal peer teaching as a method for active learning: an experience in an electrotechnical laboratory. *J Sci Educ Technol* 2014;22(5):729–734.

25. De Backer L, Van Keer H, Moerkerke B, Valcke M. Examining evolutions in the adoption of metacognitive regulation in reciprocal peer tutoring groups. *Metacognition Learn* 2015;27(1).

26. Williams B, Hardy K, McKenna L. Near-peer teaching in paramedic education: results from 2011 to 2013. *Med Sci Educ* 2015;25(2):149–156.

27. Hardy E, Hearnden R, Laban, A, et al. Peer Assisted Learning in Midwifery: a case study. *Stud Engagem Exp J* 2014;3(1).

28. National Health and Medical Research Council. NHMRC additional levels of evidence and grades for recommendations for developers of guidelines. ⟨https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf⟩ (Accessed December, 2015); 2009.

29. CASP. *Critical Appraisal Skills Programme Making Sense of Evidence*. 2013.

30. Cooper SJ, Cant R, Porter, J, et al. *Simulation Based Learning in Midwifery Education: A Systematic Review*. 2012.

31. Bennett D, O'Flynn S, Kelly M. Peer assisted learning in the clinical setting: an activity systems analysis. *Adv Health Sci Educ* 2014:1–16.

32. Scott D, Jelsma J. The effectiveness of peer taught group sessions of physiotherapy students within the clinical setting: a quasi-experimental study. *J Peer Learn* 2014;7(1):105–117.

33. Kassab S, Abu-Hijleh MF, Al-Shboul Q, Hamdy H. Student-led tutorials in problem-based learning: educational outcomes and students' perceptions. *Med Teach* 2005;27(6):521–526.

34. Bridgestock R. The graduate attributes we've overlooked: enhancing graduate employability through career management skills. *High Educ Res Dev* 2009;28(1):31–44.

35. Kyllonen PC, Lipnevich AA, Burrus J, Roberts RD. Personality, motivation, and college readiness: a prospectus for assessment and development. *ETS Res Report Ser* 2014;2014(1):1–48.

36. Ensergueix PJ, Lafont L. Reciprocal peer tutoring in a physical education setting: influence of peer tutor training and gender on motor performance and self-efficacy outcomes. *Eur J Psychol Educ* 2010;25(2):222–242.

37. Hammond JA, Bithell CP, Jones L, Bidgood P. A first year experience of student-directed peer-assisted learning. *Act Learn High Educ* 2010;11(3):201–212.

38. Manyama M, Stafford R, Mazyala, E, et al. Improving gross anatomy learning using reciprocal peer teaching. *BMC Med Educ* 2016;16(95):1–12.

39. De Backer L, Van Keer H, Valcke M. Promoting university students' metacognitive regulation through peer learning: the potential of reciprocal peer tutoring, 1–18. *High Educ* 2015: 1–18.

40. Ursache A, Blair C, Raver C. The promotion of self-regulation as a means of enhancing school readiness and early achievement in children at risk for school failure. *Child Dev Perspect* 2012;6(2): 122–128.

41. Doorn J, Doorn J. The quest for knowledge transfer efficacy: blended teaching, online and in-class, with consideration of learning typologies for non-traditional and traditional students. *Front Psychol* 2014;5(2014).

42. Engestrom Y. Expansive learning: toward an activity-theoretical reconceptualization. In (pp. 53–73). In: Knud I, editor. *Contemporary Theories of Learning: Learning Theorists in Their Own Words*. New York: Routledge; 2009. p. 53–73.

43. Topping K. Paradoxical effects of feedback in international online reciprocal peer tutoring. *Comput Educ* 2013;61:225–231.

44. Gaberson KB, Oermann MH, Shellenbarger T. *Clinical Teaching Strategies in Nursing*, 4. New York: Springer Publishing Company; 2015.

45. Ross MT, Cameron HS. Peer assisted learning: a planning and implementation framework: AMEE Guide no. 30. *Med Teacher* 2007;29(6):527.