

MESTRADO EM EDUCAÇÃO ACADÉMICA E CLÍNICA

Peer feedback for learning in health higher education: a scoping review and its contribution to osteopathy education

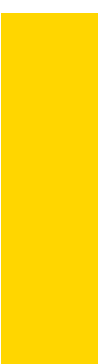
André Poças Reis da Silva

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FACULDADE DE MEDICINA



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ORIENTAÇÃO

Professor Doutor Amândio Graça

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As minhas conquistas enquanto estudante estão intimamente relacionadas com o tempo que a minha família me possibilita ter para concretizar os meus objetivos. Por isso, como não podia deixar de ser, a primeira palavra de gratidão é endereçada à Joana. Sem o seu forte apoio, compreensão e incentivo incondicional, nada disto seria possível.

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Resumo

O feedback desempenha um papel essencial na aprendizagem, influenciando significativamente o desempenho dos estudantes. No contexto do ensino superior em saúde, o feedback dos pares ou *peer feedback* tem surgido como uma abordagem pedagógica promissora, promovendo a autorregulação, o pensamento crítico e o desenvolvimento profissional. No entanto, a sua aplicação enfrenta desafios como a variabilidade na qualidade do feedback fornecido, barreiras emocionais e dificuldades na sua implementação de forma eficaz.

O objetivo deste estudo é compreender a eficácia do *peer feedback* como estratégia pedagógica no ensino superior das ciências da saúde e explorar o seu potencial na educação osteopática, que começa a integrar uma abordagem baseada na evidência. Nesse sentido, foi conduzida uma *scoping review* para mapear a literatura existente, identificar os benefícios e desafios do *peer feedback* e discutir recomendações para sua aplicação no ensino da osteopatia.

A metodologia seguiu as diretrizes da Joanna Briggs *Institute para scoping reviews*, analisando artigos científicos disponíveis nas bases de dados *EBSCOhost*, *PubMed*, *Web of Science* e *Scopus*. Após um processo rigoroso de seleção, foram incluídos 10 estudos que examinaram a utilização do *peer feedback* em contextos de ensino das ciências da saúde. Os resultados indicam que o *peer feedback* pode melhorar a participação dos estudantes no processo de ensino-aprendizagem, a capacidade de autorreflexão e a prática colaborativa, embora a sua implementação eficaz dependa de um ambiente educacional estruturado e de formação para desenvolvimento de competências que permitam fornecer e receber um feedback construtivo. A partir desta análise, conclui-se que o *peer feedback* é uma ferramenta valiosa para a educação osteopática, promovendo uma aprendizagem mais ativa e colaborativa. No entanto, são necessárias mais investigações para explorar a sua aplicação em contextos académicos e clínicos e o seu impacto no desenvolvimento das competências profissionais dos estudantes.

Abstract

Feedback plays a fundamental role in learning, significantly influencing student performance. In the context of higher education in health sciences, peer feedback has emerged as a promising pedagogical approach, fostering self-regulation, critical thinking, and professional development. However, its implementation faces challenges such as variability in feedback quality, emotional barriers, and difficulties in ensuring its effectiveness.

This study aims to understand the effectiveness of peer feedback as a pedagogical strategy in health higher education and to explore its potential within osteopathic education, where evidence-based teaching is beginning to gain attention. To achieve this, a scoping review was conducted to map the existing literature, identify the benefits and challenges of peer feedback, and discuss recommendations for its integration into osteopathic education.

The methodology followed the Joanna Briggs Institute guidelines for scoping reviews, analysing scientific articles from databases such as EBSCOhost, PubMed, Web of Science, and Scopus. After a rigorous selection process, 10 studies were included, examining the use of peer feedback in health education contexts. The results indicate that peer feedback enhances student engagement, self-assessment abilities, and collaborative learning, although its effectiveness depends on a structured educational environment and the development of skills for providing and receiving constructive feedback.

Based on this analysis, the study concludes that peer feedback is a valuable tool for osteopathic education, promoting more active and collaborative learning. However, further research is needed to explore its application in academic and clinical settings and its impact on the professional development of students.

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Introduction

Feedback plays a fundamental role in education, serving as a bridge between teaching and learning. Over the years, research has consistently highlighted the impact of feedback on student performance, emphasising its ability to guide learners in their cognitive and skill development. However, the traditional teacher-centred model of feedback delivery presents challenges such as time constraints, limited opportunities for interaction, and a lack of immediate response. In this context, peer feedback emerges as a promising alternative, fostering active learning, engagement, and self-regulation among students.

Peer feedback, a process where students evaluate and provide constructive input on each other's work, has gained increasing attention in higher education, particularly in health sciences. It not only enhances learning outcomes but also cultivates critical thinking, communication skills, and professional development. Despite its potential benefits, implementing peer feedback in higher education is not without challenges. Issues such as the reliability and quality of feedback, emotional barriers, and the need for adequate training pose significant obstacles to its effectiveness.

Osteopathic education, like other health professions, requires students to develop both theoretical knowledge and practical skills. Given the hands-on nature of osteopathy, peer feedback can play a crucial role in refining students' clinical reasoning, palpation techniques, and patient management skills. However, the extent to which peer feedback has been explored and utilised in osteopathy education is limited. The subject has not received much academic attention, but this has been changing in recent years with some studies on topics that are closely related to peer feedback being published in the osteopathy field.

This research is conducted within the framework of the Master's Degree in Academic and Clinical Education at the Faculty of Medicine of the University of Porto (FMUP), which focuses on studying and debating innovative teaching methodologies to improve learning and increase student engagement. By examining peer feedback as a pedagogical strategy in higher education in other health sciences, this study aims to understand how we can make this teaching and learning tool more effective and how we can leverage it within osteopathic education, where evidence-based education is now beginning to be discussed, fostering a more collaborative, evidence-based, and student-centred approach. The findings of this research will contribute to the broader discussions on curricular reform in health education, assessment strategies, and competency-based learning models.

To develop a structured and coherent analysis, this thesis begins with a conceptual analysis of feedback, exploring its historical context, evolution, and theoretical underpinnings. The study traces the origins of the feedback concept from early mechanical and cybernetic systems to its application in education. The role of feedback in learning and performance is discussed in depth, emphasizing its impact on cognitive processes, motivation, and student achievement. By critically examining existing literature, this section highlights the conditions under which feedback enhances learning and identifies potential pitfalls, such as excessive reliance on corrective feedback without fostering self-regulation.

Following this, the focus shifts to peer feedback in higher education, defining its core principles and distinguishing it from peer assessment. The theoretical foundations of peer feedback are explored through a constructivist and socio-cultural lens. The advantages of peer feedback, including its potential to enhance critical thinking, communication skills, and reflective practice, are weighed against its challenges, such as variability in feedback quality, emotional resistance, and the need for structured training. This section also considers recent empirical studies that illustrate the effectiveness of peer feedback in various educational settings.

Given the specific context of osteopathic education, the study then presents a call for an upgrade in osteopathic training, starting with an overview of the history and evolution of osteopathic practice. The profession's philosophical foundations, emphasising holistic patient care and manual therapy, are discussed alongside its current challenges, including the lack of standardization in curricula and the need for stronger integration of evidence-based practices. By examining international guidelines for osteopathic training, such as those set by the WHO and the European Standard on Osteopathic Healthcare Provision, this section establishes the need for pedagogical innovation within the field.

To support these discussions, the thesis employs a scoping review methodology, mapping existing research on peer feedback in health education in higher education. The study design and methodology section outlines the rationale for selecting a scoping review, explaining how this approach allows for a comprehensive synthesis of diverse studies. A detailed account of the search strategy follows, describing the use of databases such as EBSCOhost, PubMed, Web of Science, and Scopus. The inclusion and exclusion criteria are carefully justified to ensure that only relevant empirical studies are analyzed. The study selection process is visually represented through a PRISMA flow diagram, illustrating how articles were filtered and refined to build a robust evidence base.

The results section presents key findings from the reviewed studies, categorizing them based on their research methodologies, objectives, and conclusions. The analysis reveals that most peer feedback studies employ mixed-methods approaches, integrating qualitative and quantitative techniques to assess effectiveness. Common research themes include the impact of peer feedback on academic performance, student perceptions of feedback processes, and the role of feedback in skill development. The results also highlight the primary challenges of peer feedback implementation, including time constraints, training deficiencies, and cultural resistance to peer evaluation. Conversely, the benefits of peer feedback are underscored, with studies demonstrating improvements in students' self-assessment abilities, teamwork skills, and overall engagement with learning.

Building on these findings, the discussion section critically evaluates the implications of peer feedback for osteopathic education. By comparing the results with existing literature, the study contextualizes peer feedback within broader educational frameworks, emphasizing its alignment with competency-based learning models. The potential for peer feedback to shift assessment practices from summative to formative evaluation is explored, highlighting its role in fostering lifelong learning skills. Challenges related to the implementation of peer feedback in osteopathy curricula are discussed in depth, with recommendations for overcoming barriers such as training gaps and resistance to change. Best practices from other health disciplines are considered as potential models for integrating peer feedback into osteopathic training programs.

Finally, the conclusion synthesizes the study's key insights, reaffirming the importance of peer feedback in enhancing learning and performance in osteopathic education. The limitations of the research are acknowledged, particularly regarding the scope of the scoping review and the need for further empirical studies within osteopathy. Future research directions are proposed, encouraging more targeted investigations into the application of peer feedback in clinical training environments. The study ultimately advocates for the adoption of structured peer feedback mechanisms in osteopathic education, positioning them as essential tools for professional growth and evidence-based practice.

1. Research objectives

Peer feedback has become a cornerstone in educational practices, fostering collaborative learning and enhancing both individual and collective performance. To understand its impact, it's essential to examine the designs and research methods employed in peer feedback studies. The topic can certainly be studied from various perspectives: student motivation, self-regulation, co-regulation, contribution to the evaluation, collaborative learning or academic performance. We are also interested in understanding the objectives of the studies that have been conducted on this topic.

Our goal is also to learn about the obstacles and difficulties involved in implementing it in the curriculum, as well as the benefits it brings, and the alterations it can make to educational reform.

This review seeks to address the following research questions:

1. What were the designs and research methods of peer feedback studies?
2. What were the objectives of peer feedback studies?
3. What are the challenges of implementing peer feedback in educational settings?
4. What are the benefits of incorporating peer feedback into the educational curriculum?

2. Conceptual analysis of feedback

1.1 Historical Context and Evolution of the Feedback Concept

Teachers' concern about the impact of their words on student performance dates back at least to 1950 (Page, 1958). Ellis B. Page was one of the first researchers to care about the feedback effect, although he never used the term feedback. Previous investigations were limited only to the works related to "Praise and Blame", which lacked the rigour of the scientific method (Page, 1958).

If we want to dive deep into the concept of feedback, we must go back to 1788 when James Watt invented the centrifugal governor on the steam engine, which was what feedback loops were called back in the 18th century (Otto, 1971). A Governor *"is a part of a machine by means of which the velocity of the machine is kept nearly uniform, notwithstanding variations in the driving power or the resistance"* (Maxwell, 1868, p. 270). We can then realize that the concept of feedback emerges alongside self-regulatory mechanisms of engineering. Thus *"the earliest known instance of an adequately formulated economic feedback loop is found in David Hume's (1711-76) theory of the self-regulating mechanism of international specie distribution"* (Otto, 1971, p. 3).

The concept of feedback was popularized by Wiener (1950) in mathematics and cybernetics. In his book "The Human Use of Human Beings", the author defined feedback as *"the control of a system for reinserting in the system the results of its performance"* (p. 71). It is very interesting to notice the parallelism made at that time between man and machine relative to the need for one and the other to self-regulate:

I have said that man and the animal have a kinaesthetic sense, by which they keep a record of the position and tensions of their muscles. For any machine subject to a varied external environment, in order to act effectively, it is necessary that information concerning the results of its own action be furnished to it as part of the information on which it must continue to act (Wiener, 1950, p.?).

In the education field, Bloom (1956), who gained notoriety for his taxonomy, was one of the first authors to use the concept of feedback, pointing out its importance in the revision of the educational process. Years later, Bloom repeated the warning, now reporting on learning outcomes:

As students are provided with feedback on what they have learned over a particular learning task and as they are given additional time and help to correct their difficulties, they enter the next learning task with a better grasp of the preceding learning tasks in the series. When they are given no feedback or extra time and help, a significant portion of the students enter the next learning task with an inadequate grasp of the preceding learning tasks in the series (Bloom, 1974, p. 686).

1.2 Impact of Feedback on Learning and Performance

Over the years, many studies have pointed to the same conclusions as Bloom, which refer to the role of teacher feedback in improving student outcomes and performance (Anderson et al., 1971; Gilman, 1969; Hattie, 1999; Schunk, 1989; Schunk & Rice, 1991). Nevertheless, further research proved that these results were not so linear (Ilgen et al., 1979; Kulhavy & Anderson, 1972; Surber & Anderson, 1975). Although there is no doubt that feedback contributes to increasing what a learner knows about an instructional unit, some conditions have been discovered under which it fails in its facilitative role. First, if feedback is highly available before the students perform the task, they will likely copy it instead of remembering it (Surber, 1975). Second, if the material to be studied is very difficult or completely unknown to the student, seeking feedback will have minimal effect on the student's performance (Kulhavy, 1977). Third, the timing of feedback delivery, defined as the interval between the individual's behaviour and the receipt of the feedback about it (Ilgen et al., 1979), was an issue that began to be widely investigated and discussed (Ilgen et al., 1979; Kulhavy & Anderson, 1972; Surber & Anderson, 1975). Finally, the differences in perception and response between positive and negative feedback were also discussed (Ende, 1983; Feather, 1968; Ilgen et al., 1979).

In this context, one of the significant conclusions was reached through meta-analysis from Kluger and DeNisi (1996), who realize that not all feedback interventions improve performance. Some produce no changes in achievement, and there are even others that have a negative impact on performance. Other researchers later verified these findings (Carless, 2006; Carless et al., 2011; Hattie, 1999; Hattie & Timperley, 2007; Price et al., 2010).

Kluger and DeNisi (1996) established a preliminary theory that feedback interventions should be thought of and investigated at three hierarchical levels of attention: task-related learning, task-related motivation, and meta-task processes, including self-related ones. According to the authors:

Meta-task processes include processes that link the focal task with higher-order goals, such as the evaluation of the implication of task performance for the self. Meta-task processes include processes that have considerable effects on performance, such as attention to the self-affect, and possibly framing effects" (p. 262).

The researchers tried to understand how various feedback interventions affect educational performance and found that if this intervention is provided for a familiar task containing cues that support learning (close to the task-related and far from the meta-task process) is susceptible to cause excellent gains on learning.

The work of Kluger and DeNisi was fundamental for two reasons: first, positioning feedback as a process of the meta-cognitive domain allows us to conclude that the student him/herself generates internal feedback in an attempt to establish a connection between the new information and the one, he/she already has. This idea leads us to a more complete definition of the feedback concept, which belongs to Winne and Butler (1994, as cited by Hattie & Timperley, 2007, p. 82): *"Feedback is information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, meta-cognitive knowledge, beliefs about self and tasks, or cognitive tactics and strategies"*. A year later, the quoted authors went further and said that the *"most effective learners are self-regulating"* (Butler & Winne, 1995, p. 245). They strive to devise strategies internally that will lead them to achieve their learning goals. There is constant internal monitoring. Nevertheless, when there is a discrepancy between current knowledge and what one wants to acquire, students seek feedback from an external source through a colleague, working groups, a teacher or even a book (Butler & Winne, 1995). The work of the authors was crucial for a second reason. It enabled other researchers to conduct further studies that validate their findings. This is similar to the synthesis of over 500 meta-analyses conducted by Hattie in 1999, which represented approximately 180,000 studies (Hattie, 1999). Hattie found that some types of feedback are more effective than others. The more powerful ones (highest effect sizes) involve learners receiving information feedback about a task and how to do it more effectively. That includes cues or reinforcement to learners and also forms of feedback related to goals. In addition, feedback seems to have a more powerful effect when viewed as a lower threat to self-esteem than higher levels of threat to the self. On the contrary, feedback related to praise, rewards or punishment presents lower effect sizes (Hattie & Timperley, 2007). Some authors do not consider the rewards as feedback but rather as contingencies to activity since it contain very little information (Deci et al., 1999). In their meta-analysis of the effects of feedback on intrinsic motivation, Deci et al (1999) conclude that rewards tend to prevent self-regulation. Besides, they have shown a negative correlation between extrinsic rewards and task performance. They stated that rewards *"undermine people's taking responsibility for motivating or regulating themselves"* (Deci et al., 1999, p.659).

Hattie and Timperley proposed a model where effective feedback should answer three major questions: Where am I going? (question-related to the goals), how am I going? (question-related to the progress), and where to next? (question-related to the activities to be undertaken to continue to progress) that correspond to the notions of feed up, feed back and feed forward, respectively. Just as important, they say that the most significant discriminating factor in feedback effectiveness is whether it is directly related to the task and its regulation

and not to the self-level, drawing attention to the environment within the classroom, which should allow not only self but also peer evaluation to learn from mistakes (Hattie & Timperley, 2007).

2 Peer Feedback

The information agent giving feedback may not be a teacher, but a colleague, or even a relative, a book or an experience (Hattie & Timperley, 2007). Now is the time to focus on the comments of colleagues as a form of feedback. We intend to review and analyse the available literature on the subject and understand the actual evidence of its contribution to learning. What learning means and how it is evaluated are the major questions. We cannot move forward without first attempting to answer both of those questions.

For this purpose, we adopt the definition of Tony Bingham and Marcia Conner who establish learning *“as the transformative process of taking in information that, when internalized and mixed with what we have experienced, changes what we know and builds on what we can do. It’s based on input, process, and reflection. It is what changes us”* (Bingham & Conner, 2010, p. 19).

It is worth noting that some of the most renowned authors who have written on the sciences of education, including Dewey (1897), Skinner (1958), Piaget (1964), and Vygotsky (1967), also considered learning as a process and not an outcome. Dewey (1897, p. 79) even stated that *“the process and goal of education are one and the same thing”*. Skinner (1950, p. 195) added that *“we feel sure that the learning process itself is continuous, orderly, and beyond the accidents of measurement”*.

The ideas of all these researchers, whether classical or contemporary, prompt us to reflect that, to improve learning in higher education, as noted by Koby (2005), priority should be given to student engagement with this process. And for this to be possible it should include feedback on the effectiveness of your learning efforts (Kolb & Kolb, 2005). Bingham and Conner summarize *“When you engage with people, you build your own insight into what’s being discussed. Someone else’s understanding complements yours, and together you start to weave an informed interpretation. You tinker until you can move on”* (2010, p. 10).

These authors developed a theory called *“new social learning”*, where they argue that learning is a social act. They assert that learning happens with and through other people when they participate in a community, not only by acquiring knowledge. Participation and engagement are the keywords of an ecosystem of learning where asking and receiving feedback from others is a constant.

The recognition of learning as a social act is not a new concept. It is one of the main pillars of John Dewey’s theory (Dewey, 1897, 1900, 1903), later refined by other researchers such as Piaget (1964), Vygotsky (1967), and Bandura (1989; 2001). Bandura (2001, p. 13) has even stated *“People do not live their lives in isolation. Many of the things they seek are achievable*

only through socially interdependent effort". What is truly new are the educational requirements of today's world. Literacy skills, such as reading, writing, and calculating, were the focus of education in the early part of the twentieth century. But current reality demands people to learn how to think critically, to be flexible and adaptive to new situations, to solve complex problems, to handle the challenges of new technologies and to communicate clearly and assertively. These are so-called higher-level skills (National Research Council, 2000). The new theory of learning stated by the National Research Council is focused on knowledge with understanding, not just on memorizing facts. To achieve this level of knowledge, it is necessary to establish certain pillars around which learning should take place: the student's prior knowledge of the new learning should be valued and serves as a great starting point for grasping the new information, priority should be given to active forms of learning rather than passive strategies, learning should be student-centred but attention should also be paid to his community and the environment within the classroom. In this community, where teachers and peers are involved, it is crucial for them to receive and give feedback regularly to monitor their level of understanding.

To conclude this discussion on the nature of learning, it's important to recall the words of Alice and David Kolb: *"Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world."* (Kolb & Kolb, 2005, p. 194). It's a holistic process, involves thinking, feeling, perceiving and behaving. Conflicts, differences and disagreements make it move forward and backwards (Kolb & Kolb, 2005). And so, we argue that feedback from those who are so close to us, like peers is critical.

The other major question is assessment. It is necessary to distinguish the two main forms of doing it. One type of assessment is called formative and involves the use of feedback as a source for improving performance. The other type is known as summative and measures what students learn at the end of a learning activity (National Research Council, 2000). Formative assessment results from cognitive, constructivist, and sociocultural theories (Shepard, 2000). We have previously discussed these theories, but Shepard summarizes their main principles: learning is an active process of mental construction; intellectual skills are socially and culturally developed; the old structures of knowledge and student beliefs influence the new learning and Intelligent thought involves "metacognition" or self-monitoring of learning and thinking.

Brown (1999, p. 6) states that formative assessment is *"primarily characterized by being continuous"* but Yorke (2003, p. 479) disagrees saying that *"formative assessment can be very occasional, yet still embody the essential supportiveness towards student learning"*.

The purpose of formative assessment is to determine how student responses (performances, pieces, or works) can be shaped and improved through judgments on their quality while

summative is concerned with summarizing student's achievement status, especially for certification purposes (Sadler, 1989). The summative approach derived from the idea of social efficiency and scientific measurement in the curriculum, which were prevalent in the 20th century and is still dominant (Shepard, 2000). Following social efficiency theory, schools, like other areas of society, must maximize the efficiency of factories and eliminate waste. So it was required to use precise measurement standards to ensure that each skill was mastered at the desired level. It was impossible to teach every student every vocation, so scientific measures of ability were necessary to predict their future role in life and determine who was best suited for each endeavour (Shepard, 2000). In addition to these curriculum theories, Edward Thorndike's associationism (Thorndike, 1918; Thorndike, 1922) and Hull's (Hull, 1943) and, Skinner's (Skinner, 1958, 1984) behaviourism conceived learning as an accumulation of stimulus-response associations. Shepard synthesizes again the key assumptions of these models: the process of learning involves accumulating atomized bits of knowledge, sequenced and hierarchical learning content is required, to proceed to the next objective, it is important to use tests frequently, testing and learning are inseparable.

Some academic researchers prefer to use the expression "assessments for learning", (AfL), contrasting it with traditional assessments of learning (AoL). *"Assessment for learning is any assessment for which the first priority in its design and practice is to serve the purpose of promoting students' learning. It thus differs from assessment designed primarily to serve the purposes of accountability, or of ranking, or of certifying competence"*(Black et al., 2004, p. 10). Schuwirth and Van der Vleuten (2011) argue that the assessment for learning process is closely linked to the educational process. This approach provides maximum information to guide and support individual students' learning, enabling them to reach their full potential.

The idea of assessment for learning is not new as Martinez and Lipson (1989) already proposed it. Although the concept of assessment for learning was still in its early stages of development, there was a growing realization that traditional testing methods that simply categorize and rank students were no longer sufficient. While the current focus is on administering more frequent assessments and providing more feedback, this shift is an important step towards making assessments a more relevant and integral part of education

Earl (2003) introduced an additional concept to the already existing two notions of assessment for learning (AfL) and assessment of learning (AoL). This new notion is called "Assessment as Learning" (AaL). This type of assessment puts emphasis on students' active involvement in self-assessment and self-directed learning as a separate function to improve the learning process. Earl aimed to highlight the crucial role of the student in connecting the assessment and learning process, which supports the development of metacognitive and self-regulated learning skills.

It is easily understood that feedback, as a pedagogical instrument, is much closer to formative evaluation than summative, although Yorke (2003) notes that the distinction between the two forms of assessment is not so clear, since even a summative approach (the student passes or fails a module for example) can act formatively if the student learns from it.

Despite Yorke's argument, there appears to be a consensus that there is a need to provide more opportunities for formative evaluation (Alexander & Murphy, 1998; Black & Wiliam, 2009; National Research Council, 2000; Sadler, 1989; Shepard, 2000), to explore feedback practices (Boud & Molloy, 2013; Carless et al., 2011; Nicol et al., 2014; Shute, 2008), and prioritize the feedback of peers (Gielen et al., 2010; Liu & Carless, 2006; Perera et al., 2010) in the curriculum reform that has been largely requested (Caspersen & Frølich, 2017; Lozano et al., 2017; Tight, 2023; Wiek et al., 2011).

Peer feedback is a communication process that involves learners engaging in performance and standards dialogues (Liu & Carless, 2006). Authors note that peer feedback can enhance learning by providing students with diverse perspectives and encouraging reflective practice. Topping (1998) defines peer feedback as a process which students provide comments to their peers on their work, such as assignments, projects, or writing. This feedback is typically given based on predetermined criteria or guidelines and aims to help the recipient improve their work by identifying strengths, weaknesses, and areas for development. In the study by Sarah Gielen and colleagues (2010), a similar definition is used, which defines peer feedback as qualitative comments that peer students provide to evaluate their fellow students' performance against set criteria. Nicol and Macfarlane-Dick (2006) focus on peer feedback as a value pedagogical tool in promoting self-assessment and reflective learning among students while Bound (1988) see peer feedback as a form of formative assessment that allows students to provide and receive constructive comments on each other's performance, facilitating a deeper understanding of the subject matter and promoting critical thinking and self-assessment skills.

On the contrary peer assessment is a way for students to evaluate their colleagues' work and performance through grades, using well-defined criteria (Falchikov, 2003). This difference is fundamental and we share the same vision of Liu and Carless (2006, p. 280): *"Peer feedback is primarily about rich detailed comments but without formal grades, whilst peer assessment denotes grading (irrespective of whether comments are also included"*. The emphasis is not on grades but rather on how peer interaction can lead to improve learning and performance.

For this research project, we have adopted the definition of peer proposed by Bound (2013):

"peers are other people in a similar situation to each other who do not have a role in that situation as a teacher or expert practitioner. They may have considerable experience and

expertise or they may have relatively little. They share the status as fellow learners and they are accepted as such. Most importantly, they do not have power over each other by virtue of their position or responsibilities” (p. 4).

It's fair to acknowledge that peer feedback research is likely based on the background work on Falchikov's peer assessment, which is perhaps the most influential author in the study of peer-to-peer relationships focused on evaluation (Falchikov, 1995, 2003, 2013; Falchikov & Goldfinch, 2000). Falchikov sees peer assessment as rooted in philosophies of active learning and andragogy, and could also as a manifestation of social constructionism as it frequently involves the joint construction of knowledge through discourse (Falchikov & Goldfinch, 2000). Through her research, the author demonstrated that the use of peer assessment activities can enhance learning (Falchikov, 1986), outcome also attested by Boud (1988). By comparing peer and teacher marks in a meta-analysis of 48 quantitative studies, it was also verified that students are generally able to make reasonably reliable judgments. Despite recognizing the importance of establishing the reliability of students' judgments, worthy of the effort of other authors (Dochy et al., 1999; Topping, 1998), this purpose deserves a deeper reflection:

“Many academics became tied to the quantitative analyses of innovative assessment procedures because of the extreme pressure to ‘prove’ that students could be as reliable as ‘assessors’ as the tutors ... in much of the literature there was almost a fixation over the statistical analyses of student derived marks and grades often at the cost of a qualitative analysis of the effects of these procedures on student learning...” (Stefani, 1998, p. 343)

Stefani (1998) does not stand against the quantitative studies that have been done and have made a big difference in the way we see the learning process. Instead, the author emphasizes the need to find new methods to better understand this process through more qualitative studies. As pointed out by Liu and Carless (2006), the role of peers in assessment processes should go beyond just grading peers' work and comparison of their scores to the tutor's. The literature also offers some encouragement for concentrating on peer feedback instead of peer assessment.

According to Sluijsmans et al. (2001), students preferred to only provide feedback rather than assign grades because they felt uneasy doing so. Boud (1999, p. 11) asserts that "*ranking, or rather the anticipation of ranking, is a sure way to inhibit cooperation*". Tornwall (2018) goes further, since although acknowledging that peer assessment can contribute to developing students' critical thinking, it can also lead to a sense of incompetence, anxiety and a hostile learning environment. Falchikov recognised that some students were opposed to assigning

grades to their colleagues, especially in the setting of a small, well-established group. The author identified a problem regarding loyalty between colleagues who prefer to praise rather than criticize (Falchikov, 2003, 2013; Falchikov & Goldfinch, 2000), and even stated that *"student peer assessment can successfully focus on the provision of feedback and may also be used in the absence of marking"* (Falchikov & Goldfinch, 2000, p. 318).

Peers are under-utilized in higher education, despite their potential to aid learning as much as teachers (Boud, 1988). Giving the example of David Potts's course, organized around the principle of students helping each other to learn, Boud (1988) recommends that, despite learning between peers happening informally, the teacher should be involved in creating a favourable environment for it to take place. Boud et al. (1999) provides an extremely valuable way to utilize peer feedback, which aids the student in improving their self-assessment. This achievement can be enhanced by peer contributions which may take the form of questions, comments or challenges which prompt one to reflect on what has been done. This point is also shared by Butler and Winne (1995) who declare that peers can act as an external source of feedback for self-regulated learners in group activities as an example. The investigators pointed out that this type of feedback influences learning through acts of monitoring not only at the surface level (superficially scanning memory to estimate whether information about a concept or schema exists) but also at a deeper level, which may reveal other forms of cognitive processing. The same conclusion was reached by Nicol and MacFarlane-Dick (2006) mentioning students develop an objectivity about standards that can be applied to their own work by commenting on the work of their peers.

A new understanding of the classroom as a place where learning can be correlated has emerged based on these views (Allal, 2011; Perrenoud, 1998). The term co-regulation of learning refers to the interaction between student self-regulation and external sources, including teachers, peers, curriculum materials and assessment instruments on student learning (Allal, 2010; Allal, 2011).

According to Liu and Carless (2006), the rationale for introducing peer feedback is the fact that it enables students to better self-assess themselves, allowing them to play an active role in the management of their learning. Falchikov (1995) therefore proposed an assessment approach that focuses on feedback from peers rather than grading, denominated Peer Feedback Marking. The final ranking of peers was unchanged but conducted anonymously. This scheme of peer input has been shown to improve student learning through reflection, analysis, and tactful criticism.

Another practical reason for peer feedback is that students would receive more feedback from peers and more promptly than they would from teachers (Gibbs, 1999). With declining

academic capacity to provide adequate feedback and increasing budget constraints, peer feedback might become a core part of the learning process as mentioned by Liu and Carless (2006).

Lastly, a further important motive to engage learners in peer feedback reported to the same authors, is that learning can be extended from a private sphere to a more public domain, which social learning can be facilitated:

One important way we learn is through expressing and articulating to others what we know or understand. In this process of self-expression, we construct an evolving understanding of increasing complexity...this is where examining the work of peers offers meaningful opportunities for articulating discipline-specific knowledge, as well as criteria and standards (Liu & Carless, 2006, p. 281).

Once we have reached this point, the question to be asked is: what is the way forward? Self-reflection, constructive dialogue and peer learning are key values of the European Higher Education Area for the time frame of 2021-2024 (European Higher Education Area, 2021) In keeping with its ongoing commitment to a student-centred learning approach, the organization has developed a set of principles, one of which (the seventh principle) is "*Students should have Control Over their Learning*" (European Students' Union, 2015). The European Commission project holds the view that students ought to have the chance to contribute to the creation of curricula, courses, and assessments. Therefore, it's possible that peer feedback cannot be fully considered outside of the evaluation context. Liu and Carless (2006) offer three suggestions: creating a course environment that encourages peer feedback; developing techniques for getting students involved with criteria and integrating peer feedback with grading in a more flexible way. In this last proposal, suggestions are made to reduce bias, peer evaluation could involve several peers or alternatively, not all peer-generated marks might need to be taken into account for summative evaluation. Additionally, students might take charge of the process by selecting their best peer-reviewed work to include in a learning portfolio.

Bloxham and West (2004) thought of a method where tutors awarded 25% of their assignment grades for the quality of peer marking to encourage their students to take it seriously. This was an innovative element which seemed to work as an additional motivation for students to consider the evaluation criteria and the feedback they write carefully. This way was acknowledged by many students as beneficial to their growth as learners.

According to Orsmond et al. (2000), peer involvement in assessment helps students learn better because it stimulates them to think more critically. They also imply that, with time, expertise, and help, students' early challenges or hesitation can be overcome.

On the other hand, Bound (2000) continues to say that using peers as assessors to generate grades is ineffective. The author places peer input under formative assessment, mostly for self-reflection and self-evaluation. He states that "*Changing feedback is at the heart of pedagogy*" (Boud, 2000, p. 158) but recognizes that "it requires a revolution in assessment thinking. As we are all products of pre-revolutionary times, we should not expect to find it easy or the path from where we are now to a new resolution a direct one" (Boud, 2000, p. 159).

However, to fully harness the potential of peer feedback as a formative evaluation tool, a fundamental change is required in the way we approach education. Curricular reform has long been requested by researchers, educators, and policymakers who acknowledge the evolving demands of the modern world. Traditional education paradigms that promote memory and passive learning are becoming increasingly unsuitable in the face of contemporary difficulties. In the 21st century, students must not only acquire knowledge but also develop critical thinking skills, adaptability, problem-solving abilities, and effective communication (National Research Council, 2000). And, like other authors (Black & Wiliam, 2009; Carless et al., 2011; Nicol & Macfarlane-Dick, 2006; Nieminen & Carless, 2022; Yorke, 2003), we feel that peer feedback, when viewed through the lens of formative assessment and self-regulation of learning, can play an important part in this debate.

3 A call for an upgrade in osteopathic education

3.1 History and Evolution of Osteopathic Practice

Osteopathy was founded by the physician and surgeon Andrew Taylor Still in the late 19th century, in the United States of America (WHO, 2010). It was initially developed as a therapeutic approach based on the idea that the body is an integrated and interdependent system capable of self-regulation and healing (Still, 1902). The philosophy emphasizes the connection between structure and function, which became the foundation of osteopathic principles.

Today, these principles are applied in patient diagnosis and treatment by combining osteopathic and medical knowledge. Osteopathic medicine focuses on patient-centred care, rather than disease-centred care. Osteopaths use manual contact to assess a patient's mobility and identify any movement or function abnormalities that could affect health. This approach relies on a strong sense of touch and a focus on the body as a whole, rather than just isolated parts (CEN's Project Committee, 2015).

By using touch, manipulation, stretching, and massage, osteopaths aim to improve joint mobility, relieve muscle tension, enhance blood and nerve supply to tissues, and assist the body's healing mechanisms (General Osteopathic Council, 2023). The contemporary osteopathic practice has evolved to incorporate more humanistic approaches that emphasize the importance of the therapeutic relationship between the patient and clinician. One key aspect of this evolution is the development of a therapeutic alliance, where the clinician actively listens to the patient and aligns with their mental state. This relationship fosters trust, empathy, and open communication, creating a more collaborative environment for healing (Esteves et al., 2022; McParlin et al., 2022; Shaw et al., 2022).

Furthermore, modern osteopathic practice integrates biobehavioural synchrony, a concept rooted in neuroscience, where the clinician and patient's actions, emotions, and physiological states are in harmony during treatment. This synchronisation enhances the effectiveness of the therapeutic process, as it helps the clinician better understand the patient's unique needs and responses. The principles of active inference and enactivism, which are part of neuroscience, suggest that the brain continuously predicts and adjusts based on sensory input and experiences. By applying these principles, osteopaths can tailor their approach to optimize healing, engaging both the body and the mind in a holistic and personalized manner (Esteves et al., 2022; Kim et al., 2022).

A key characteristic of contemporary osteopathy is its consideration of contextual factors within the clinical setting and their potential influence on the effectiveness of manual therapy. As an example, individual characteristics such as patient expectations, previous experiences with manual therapy, and psychological variables (e.g., fear, anxiety) can influence responses to treatment (Keter et al., 2025). On the other hand, provider factors, such as the therapist's empathy, therapeutic alliance, and communication style, can significantly affect patient outcomes and the perceived effectiveness of the intervention.

Presently, osteopathy is regulated in twelve European countries, with more governments actively considering regulation and licensing shortly (Osteopathy Europe, 2023). Two distinct osteopathic professions exist: osteopathic physicians, who practice in the United States, and osteopaths, who use manual therapy as their primary care profession. This study focuses on the latter group, defined as professionals who have obtained osteopathic training at a recognized educational institution and provide osteopathic care.

Individuals seeking osteopathic care are generally between 40 and 50 years old. However, children account for approximately 10-25% of patients, with nearly three-quarters of them being under the age of two. (Osteopathic International Alliance, 2020). Osteopathic patients commonly seek care for lower back, mid-back, and neck pain. However, in some countries, treatment for non-musculoskeletal conditions, such as digestive issues, headaches, respiratory conditions, and women's health concerns, is also prevalent. Most patients (79-95%) access osteopathic care through self-referral, suggesting a high level of trust and recognition of osteopathy as a viable healthcare option among the public. (Osteopathic International Alliance, 2020).

Osteopathy has been found effective for several musculoskeletal conditions based on a growing body of scientific evidence. According to guidelines from the National Institute for Health and Care Excellence (Bernstein et al., 2017), European guidelines (Airaksinen et al., 2006), and the American College of Physicians (Amir et al., 2017), non-pharmacological interventions such as manual therapy (including spinal manipulation, mobilisation, and soft tissue techniques) should be considered as treatments for low back pain and sciatica.

Research also highlights osteopathy's efficacy for low back pain (American Osteopathic Association, 2016; Franke et al., 2014; Licciardone et al., 2005), cervical pain (Franke et al., 2015; Hurwitz et al., 2009) and paediatric conditions (Cerritelli et al., 2013; Lanaro et al., 2017; Mills et al., 2003). Studies also suggest that osteopathic treatment may be beneficial in treating conditions such as migraines (Cerritelli et al., 2015), fibromyalgia (Albers et al., 2017), and pulmonary diseases (Zanotti et al., 2012).

There are currently two published international standards for osteopathic training and practice. These are the World Health Organization Benchmarks for Training in Osteopathy (WHO, 2010) and the European Standard on Osteopathic Healthcare Provision developed by Comité Européen de Normalisation (CEN) in 2015 (CEN's Project Committee, 2015). While the benchmarks describe the fundamental philosophy and principles of osteopathy, the primary types of osteopathy training programs, basic competencies, and a training curriculum that is comparable to other training programs, the CEN standard sets a benchmark for high-quality clinical practice, education, safety and ethics for Osteopathy in Europe and has been published in 33 European countries

Within the field of academic research, the number of empirical studies on osteopathy has significantly increased, particularly from 1980 to 2014, with a doubling of publications every five years. (Morin & Gaboury, 2021). Even the representation of Doctors of Osteopathy (D.O.) in orthopedic literature rose from 14 publications in 2010 to 91 in 2021. (Albana et al., 2023). Furthermore, osteopathy has reached a level of academic and scientific recognition that reflects its evolution as a healthcare field. This progress is evident in the growing attention from renowned scholars and authors from other health sciences, who show interest in the profession (Ceballos-Laita et al., 2024; Ernst, 2022; Kim et al., 2022). Such a scenario underscores the relevance of osteopathy in the interdisciplinary context, inviting specialists from various areas to engage in discussions and integrate their knowledge with osteopathic practices and principles. This dialogue contributes to the expansion of osteopathy's scientific foundation, solidifying its position as a legitimate and innovative discipline within health sciences.

3.2 Current Challenges in Osteopathic Education

Despite advancements, osteopathy faces challenges in the educational field. Historical differences in regulation between countries have led to inconsistencies in the profession's characteristics (Ellwood & Carnes, 2021; Luciani et al., 2015; McGrath, 2015; Thomson et al., 2014). As noted by MacMillan (2023), there is no agreement on what should be taught and how which is congruent with the lack of an agreed-upon definition of osteopathy and the diversity of opinions on professional identity.

Fryer (2008) points out also that the teaching of osteopathic manipulative techniques has traditionally relied on the opinions of experts and has been supported by biomechanical and physiological models that were considered plausible based on the evidence that was available

during the initial development phase. According with the same author, educators and practitioners in the field of osteopathy have been slow in accepting new and challenging scientific evidence. As a result, the profession as a whole may have retained outdated models, theories, and practices for too long.

Moreover, cognitive biases are prevalent in osteopathic diagnosis and can significantly impact clinical reasoning, affecting the quality of care provided to patients. Among the biases, Siffert points to confirmation bias, anchoring bias and the availability heuristic as the most common ones (2025).

Despite this, countries that have already completed the regulation of osteopathy and where it is recognized in a mature way as a health profession tend to have clinical practices closer to academic research and evidence, which lends itself more towards musculoskeletal health rather than other approaches (Ellwood & Carnes, 2021).

One of the goals of medical education is to prepare graduates for independent clinical practice, ensuring they possess the necessary knowledge, skills, and personal and professional capabilities to work safely (Burford et al., 2014; Illing et al., 2013). This preparation is closely tied to the extent and quality of regulation, as standardized guidelines help ensure that educational outcomes align with professional requirements. Differences in preparedness for practice varied among universities and programs (Cave et al., 2007; Van Hamel & Jenner, 2015) indicating the influence of the educational environment on it (Cave et al., 2007; Goldacre, 2003; Tokuda et al., 2010). Regulation and evidence-based practices play a pivotal role here, as they help shape educational environments to better equip graduates with the competencies required for professional excellence.

In osteopathy, Freeth et al. (2012) discovered that while graduates of UK osteopathic schools were safe to practice, they were deficient in business and practice management, patient management, and interpersonal communication skills. Similarly, students in French, Italian, and British institutions reported varying levels of preparedness (Vaughan et al., 2014). Vaughan et al. (2014) observed positive scores in Australian institutions, but Subramaniam et al. (2015) highlighted stress during transitions to practice and gaps in skills like establishing prognoses and managing risks. Graduates benefit from mentoring and supervision programs to ease this transition.

3.3 Importance of Evidence-Based Education

A recent scoping review by MacMillan et al. (2023) underscores the need for evidence-based education in osteopathy. This was the first comprehensive review mapping osteopathic education literature, revealing that research in this area began only in 2002. The review highlights a preference among students for active learning and self-directed study.

The review by Macmillan highlights the growing interest in evidence-based teaching. According to Howard et al. (2003) *“Evidence-based practice is a new paradigm that promotes more effective social interventions by encouraging the conscientious, judicious, and explicit use of the best available scientific evidence in professional decision making.”* In terms of pedagogy, evidence-based practice entails imparting to students the values and competencies required to recognize, evaluate, and apply scientific evidence that is pertinent to their professions. According to the same author, leaders and policy makers frequently lack knowledge about research and how to use it, making it difficult to adopt evidence-based education. In clinical practice, osteopaths are typically supportive of evidence based practice, have moderate evidence-based practice skills, but engage in evidence-based practice activities infrequently (Sundberg et al., 2018). Evidence from a cross-sectional study of osteopaths conducted in the UK suggests that there are a number of obstacles that osteopaths must overcome in order to participate in and use research for their practise. These include a lack of time and challenges with understanding complex data (2018). Allied health professions face similar issues, but may be supported by a broader pedogeological base (MacMillan et al., 2023). This includes, higher levels of evidence as systematic (Cant & Cooper, 2010; O’Connor et al., 2018; Steinert et al., 2006) and umbrella reviews (Cant & Cooper, 2017; Onyura et al., 2016).

One approach that can help overcome these challenges is the implementation of peer feedback strategies in osteopathy education. According to the analysis and discussion presented earlier, peer feedback involves the exchange of constructive criticism and suggestions among colleagues, enabling students and professionals to learn from each other's experiences. This practice fosters a culture of continuous learning and collaboration, encouraging participants to reflect on their clinical practices and share insights.

Although studies on peer feedback in osteopathy are scarce, related strategies like think-pair-share (Wong, 2022), teamwork skills (Vaughan et al., 2019) and near-peer teaching (Vaughan & Macfarlane, 2015; Vaughan et al., 2017) show positive outcomes. Wong (2022) considers that think-pair-share is an approach that generates a sense of community in an educational setting: *“Peer interaction is an intrinsic aspect of the approach - this paper contends that think-*

pair-share, like other forms of cooperative learning, may assist in the development of interpersonal skills” (p. 69).

Although peer feedback has not yet been widely institutionalized or systematized in osteopathy education curricula, there are notable examples of good practices in some institutions. Victoria University (Australia) has implemented peer physical examination practices as part of its osteopathy curriculum. Students engage in peer feedback, particularly during practical assessments, where they provide constructive criticism to one another (Vaughan & Grace, 2016). Southern Cross University (SCU) has a similar peer feedback model, especially in clinical settings where students assess and provide feedback on each other's physical examination techniques. The Master's program in Osteopathy at the International College of Osteopathic Medicine (ICOM) in Malta, led by Professor Jorge Esteves, incorporates advanced educational methodologies including peer feedback in various stages of the learning process. Esteves, who has extensive experience in osteopathic education, integrates both written and oral feedback mechanisms to assess and guide students through their learning journey. This program, which aims to provide a comprehensive understanding of osteopathic care, emphasizes formative assessments, ensuring that students receive valuable, constructive feedback throughout their education (Pro Osteopathie, 2024).

3.4 Recommendations for Improving Osteopathic Education

Osteopathic education is at a critical point, necessitating reforms to enhance the quality of training and ensure that graduates are well-prepared for clinical practice. As the healthcare landscape evolves, it is crucial for osteopathic programs to integrate innovative teaching methods, emphasize evidence-based practices, and foster a culture of continuous feedback among students.

One of the primary recommendations for enhancing osteopathic education is the revision of the curriculum to align with contemporary healthcare needs. This involves integrating evidence-based practices into the training framework. Research indicates that when students are exposed to evidence-based methodologies, they are better equipped to apply these principles in clinical settings (MacMillan et al., 2023).

Incorporating active learning strategies is essential for fostering student engagement and enhancing learning outcomes. Methods such as problem-based learning, simulation exercises, and collaborative projects encourage students to take an active role in their education. These

approaches not only improve critical thinking skills but also prepare students for real-world clinical scenarios (Vaughan et al., 2019).

Peer feedback is a powerful tool in the educational process, particularly in osteopathy, where practical skills and interpersonal communication are vital. Research by Liu and Carless (2006) highlights that peer feedback enhances learning by providing diverse perspectives and encouraging reflective practice. In osteopathic education, implementing structured peer feedback sessions can help students develop their clinical skills and self-assessment abilities. This process not only fosters a collaborative learning environment but also builds a sense of community among students, which is crucial for their professional development. (Liu & Carless, 2006).

To maximize the benefits of peer feedback, it is essential to provide students with training on how to give and receive constructive feedback. Studies have shown that without proper guidance, students may struggle to provide meaningful critiques, leading to ineffective feedback sessions (Daniels & Richards, 2016). Training should focus on developing skills in constructive criticism, active listening, and the ability to engage in reflective dialogue. By equipping students with these skills, osteopathic programs can enhance the quality of peer feedback and its impact on learning.

Given the current lack of specific studies on the relationship between peer feedback and learning and performance improvement in osteopathic education, further research in this area is essential. Such studies could provide valuable insights into how peer feedback can be effectively integrated into osteopathic education to enhance teaching and learning outcomes. By addressing this gap, we can work towards advancing the quality of osteopathic education and ensuring that future practitioners are well-prepared for clinical practice.

Finally, the authors of this work would like to draw attention to the importance of the atmosphere experienced and felt within the classroom. As we have seen, learning is a social act. It necessarily involves listening to others, thinking, and communicating. It is important to foster a culture of communication in the classroom, where peers can necessarily help us become better. By fostering an environment where feedback is valued and encouraged, faculty can help students develop the skills necessary for lifelong learning and professional growth.

One effective approach is to create a pedagogical intervention that fosters regular peer feedback sessions. By providing students with clear frameworks for feedback and training them on how to communicate effectively, educators can create a collaborative learning environment. Regular feedback sessions not only promote critical thinking and reflection but also equip students with valuable communication skills that are essential for their academic and professional growth.

Additionally, conducting a pilot project to test the effectiveness of these feedback strategies would provide valuable data on their impact. By measuring indicators such as student engagement, learning outcomes, and communication skills, educators can assess the success of the peer feedback process in real classroom settings. This evidence-based approach would allow for further refinement of the feedback model and offer insights into how it can be scaled to benefit a broader range of students.

4 Study Design and Method

A scoping review of the literature was conducted to investigate the effect of peer feedback on the learning of health science students in higher education, using the best practice guidance for scoping review protocol developed by members of the JBI Scoping Review Methodology (Peters et al., 2022) to produce a report with a high degree of transparency. The protocol developed was based on adapted items of PRISMA-P (Moher et al., 2015) and derived from the scoping review methodological framework from Arksey and O'Malley (2005), refined by Joanna Briggs Institute later (Peters et al., 2015).

Scoping reviews, also called “mapping review” or “scoping study” (Anderson et al., 2008; Ehrich et al., 2002; O'Cathain et al., 2013; Tricco et al., 2016), is an increasing type of research, used to identify the type of evidence available on a specific topic or some key features of a concept (Pollock et al., 2022). Tricco et al. (2016) provide an excellent summary of its value in scientific research: *“The scoping reviews identified evidence gaps (85 %), future research opportunities (84 %), strengths and limitations (69 %), and implications for policy or practice (54 %). Twelve percent (12 %) recommended a future systematic review”* (p.6). The main difference to a systematic review is that the scoping study starts from a broader question capable of generating hypotheses, while the systematic investigation focuses on a more specific question that can generate hypothesis testing (Munn et al., 2018; Peters et al., 2022). Scope reviews provide a comprehensive overview of broader issues than traditionally more accurate systemic reviews of efficacy or qualitative evidence (Peters et al., 2020). Even though the checklist items of the PRISMA 2020 statement can be applied to educational interventions (Page et al., 2021), our goal is not to evaluate the effectiveness of an intervention but rather to identify and examine the current literature on feedback and to cover the ongoing evidence on peer feedback for learning within a formative assessment.

4.1 Information sources:

Between November 2022 and January 2023, a literature search about peer feedback was carried out. Four online databases were used: EBSCOhost Research Platform [<https://www.ebsco.com/products/ebscohost-research-platform>], PubMed – National Library of Medicine [<https://www.ncbi.nlm.nih.gov/pubmed>], Web of Science Core Collection [<https://clarivate.com/products/scientific-and-academic-research/research-discovery-and-workflow-solutions/webofscience-platform>] and Scopus [<https://www.elsevier.com/solutions/scopus>].

4.2 Search strategy:

The research was conducted in the four different databases using the following Boolean expression: ("Peer Feedback" AND (health OR healthcare OR "health care" OR medical) AND ("higher education" OR college OR university OR "post secondary" OR postsecondary)). No filters were applied according to date or country. Only articles published in peer-reviewed scientific journals with open access to full text were considered. Of these, only empirical studies written in English were chosen.

4.3 Eligibility Criteria:

To be included in this scoping review papers needed to focus on the specific dimension of peer feedback for learning developed in the conceptual framework. Inclusion criteria in this review are the application of this dimension of peer feedback to students of health sciences in higher education. Other inclusion criteria include only articles published in peer-reviewed scientific journals, written only in English, and with access to full text. Different kinds of research, such as qualitative, quantitative, and mixed studies, were included.

Papers were excluded if they analysed peer feedback as a mere component of student summative assessment. The exclusion criteria drop out the articles that study peer feedback among non-health science students (e.g., education), and articles that investigate peer feedback in primary, basic, or secondary education, as well as vocational education. We also exclude articles that even studying feedback from peers from a learning perspective, have teachers, tutors, assessors, or other learning leaders as a target population. Finally, there were exclusion criteria articles that explore the motivational aspects of feedback and do not have

peer feedback as a main theme of the study but as an accessory theme (for example, studies that investigate professionalism and team projects).

4.4 Search and study selection

Two independent reviewers screened and selected studies following the PRISMA Guidelines' recommendations. A total of 163 articles were identified through the four databases used (21 in EBSCOhost Research Platform, 28 in PubMed, 52 in Web of Science and 62 in Scopus) and then subjected to a phased filtering process, as shown in the flow diagram below. After duplicate records were removed, the remaining 138 were screened in two phases. In the first phase of file examination, 28 studies were excluded based on the title, keywords and abstract and 2 studies were excluded based on the type of documents (systematic reviews, scope reviews, literature reviews, meta-analyses, as well as letters, conferences, and other kinds of short papers).

In the second phase, we screened 108 studies based on the exclusion criteria. We excluded studies with a population of students who were not in health sciences or whose purpose was to evaluate peer feedback in non-higher education. This resulted in a total of 85 articles being removed.

The remaining 23 records were eligible for full paper reading, from which 13 were refused following the exclusion criteria (studies aimed at teachers and tutors (n=5), studies investigating peer feedback for summative assessment (n=3) and studies exploring correlated topics such as motivation, professionalism and skills in a team project (n=5).

Finally, the 10 studies included in this scoping review were: (Afrasiabi, M., & Khojasteh, L, 2015), (Bevan, J., Russell, B., & Marshall, B, 2019), (Daniels, S., & Richards, R, 2016), (De la Cruz, M. S., Kopec, M. T., & Wimsatt, L. A, 2015), (Hunukumbure, A. D., Smith, S. F., & Das, S, 2017), (Kistler, E. A., Chiappa, V., Chang, Y., & Baggett, M, 2021), (Nagoshi, K., Zaidi, Z., Wright, A., & Stalvey, C, 2019), (Perera, J., Mohamadou, G., & Kaur, S, 2010), (Raut, A. V., & Gupta, S. S, 2019), (Sterz, J., Höfer, S. H., Bender, B., Janko, M., Adili, F., & Ruesseler, M, 2016).

4.5 Coding scheme and data analysis

After selecting the 10 studies included in the scoping review, data were extracted and organized into an analysis table. The main objective of this stage was to synthesize relevant information to answer the previously established research questions. For each article,

methodological details, study objectives, type of peer feedback intervention, and main results were extracted. This data was categorized into a comparative table to facilitate the identification of patterns and trends.

The initial analysis involved an exploratory reading of the articles to identify emerging themes. Using an inductive-deductive coding process, the themes were compared with existing literature to verify their coherence and relevance. The results were organized based on the four main questions formulated in the study:

1. What were the designs and research methods of peer feedback studies?
2. What were the objectives of peer feedback studies?
3. What are the challenges of implementing peer feedback in educational settings?
4. What are the benefits of incorporating peer feedback into the educational curriculum?

Each study was classified according to its contribution to these questions, allowing for a structured view of the findings.

The discussion of results was guided by the principles of scoping reviews, emphasizing the gaps identified in the literature and the pedagogical implications of using peer feedback in osteopathic education.

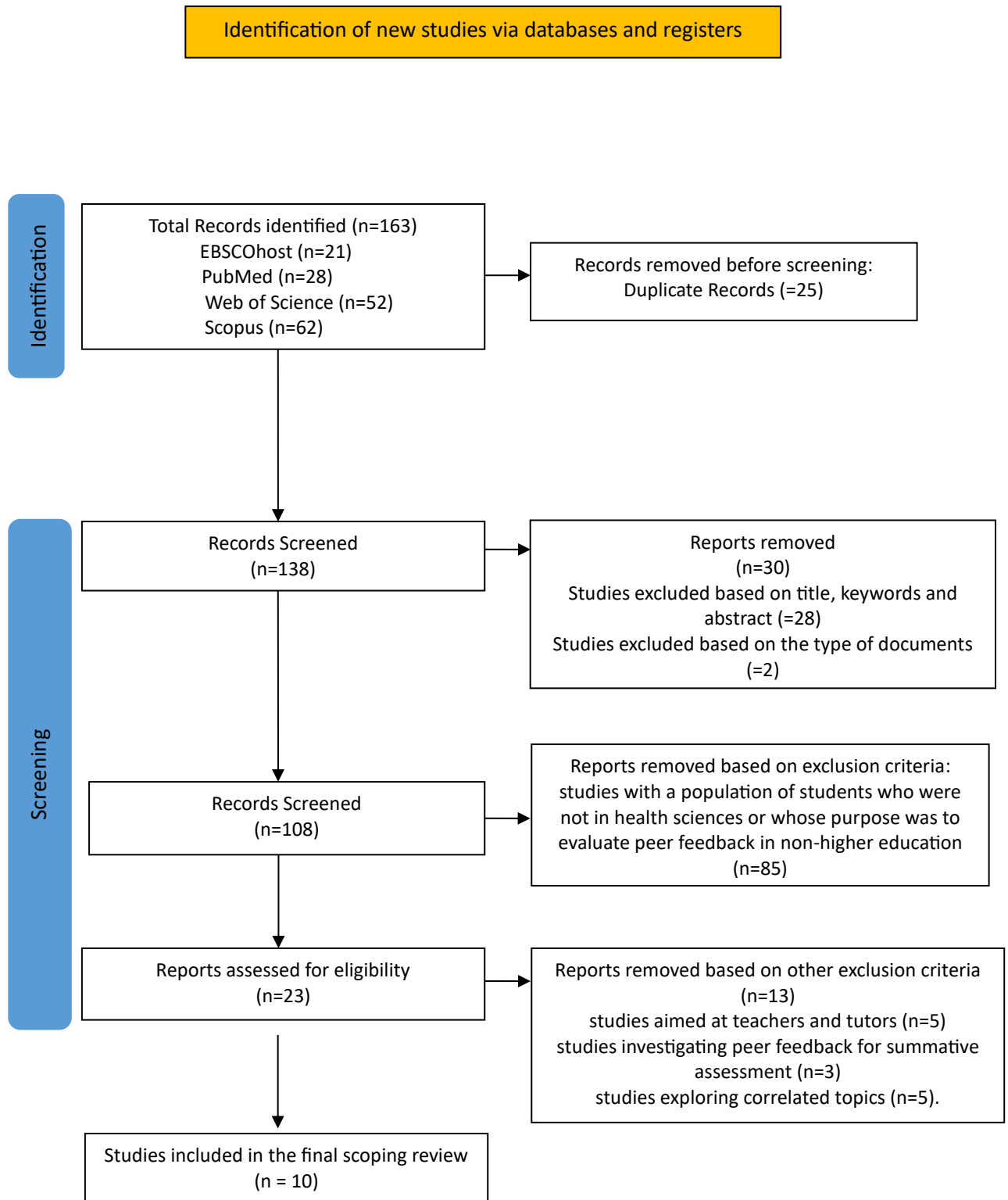


Figure 1: Flow diagram for the literature review adapted from Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021; 372: n71. doi: 10.1136/bmj.n71

5 Results

5.1 What were the designs and the research methods of the peer feedback studies?

Table 1 provides a summary of the methodological characteristics of the studies reviewed. Most of the research (7 of 10) used a mixed-method approach integrating qualitative and quantitative methods to provide a more comprehensive understanding of peer feedback. A qualitative approach was limited to three studies, and no research used a quantitative approach only. The studies that used a qualitative approach only, carried out the collection of data in different ways: students' reports (n=1), peer assessment tool (n=1), and semi-structured interviews (n=1). The remaining investigations with a mixed-method approach obtained data mainly through surveys and questionnaires (n=5). Six of ten studies conducted their research over a year.

Table 1. Characteristics of included publications

Authors & Year	Title	Publication Source	Region	Duration of research	Methodology	Data collection method	Data Analysis
Afrasiabi, M., & Khojasteh, L (2015)	The Effect of Peer-feedback on EFL Medical Students' Writing Performance	Khazar Journal of Humanities and Social Sciences	Iran	17 weeks	Mixed-method	Writing composition. Questionnaire.	Pre and post-tests T-test Two-tailed t-test.
Bevan, J., Russell, B., & Marshall, B (2019)	A new approach to OSCE preparation – ProSCES	BMC Medical Education	UK	5 months	Mixed-method	ProSCES	Online feedback survey. Freidman analysis. Regression analysis
Daniels, S., & Richards, R (2016)	From autopsy to autonomy in writing centres: postgraduate students' response to two forms of feedback in a health professions education module	Per Linguam-A Journal Of Language Learning	South Africa	1 year	Qualitative	Students' reports	Manual Analysis
De la Cruz, M. S., Kopec, M. T., & Wimsatt, L. A (2015)	Resident Perceptions of Giving and Receiving Peer-to-Peer Feedback	Journal of Graduate Medical Education	USA	1 year	Qualitative	Peer assessment tool	Survey.
Hunukumbure , A. D., Smith, S. F., & Das, S (2017)	Holistic feedback approach with video and peer discussion under teacher supervision	BMC Med Education	UK	1 year	Qualitative	Semi-structured interviews	Thematic analytical approach
Kistler, E. A., Chiappa, V., Chang, Y., & Baggett, M (2021)	Evaluating the SPIKES Model for Improving Peer-to-Peer Feedback Among Internal Medicine Residents: a Randomized Controlled Trial	Journal of General Internal Medicine	USA	1 year	Mixed-method	Survey.	Cohen's d effect size.
Nagoshi, K., Zaidi, Z., Wright, A., & Stalvey, C. (2019)	Peer-assisted feedback: A successful approach for providing feedback on United States Medical Licensing Exam-style clinical skills exam notes in the USA	Journal of Educational Evaluation for Health Professions	USA	1 Year	Mixed-method	Survey	T-Test. Multiple Correlations Cronbach α coef.- Thematica Anallisis of Braun & Clarke
Perera, J., Mohamadou, G., & Kaur, S. (2010)	The Use of Objective Structured Self-Assessment and Peer-Feedback (OSSP) for Learning Communication Skills: Evaluation Using a Controlled Trial	Advances in Health Sciences Education	Malaysi a Sri Lanka	1 semester	Mixed-method	Questionnaire	Two-tailed t-test. Comment analysis.
Raut, A. V., & Gupta, S. S (2019)	Reflection and Peer Feedback for Augmenting Emotional Intelligence among Undergraduate Students: A Quasi-experimental Study from a Rural Medical College in Central India	Education for Health: Change in Learning & Practice	India	1 year	Mixed-method	Self-assessment s and writing reflections	Descriptive analysis Mann–Whitney test Friedman's two-way ANOVA test Kendall's coefficient
Sterz, J., Höfer, S. H., Bender, B., Janko, M., Adili, F., & Ruesseler, M. (2016)	The effect of written standardized feedback on the structure and quality of surgical lectures: A prospective cohort study	BMC Medical Education	German y	6 months	Mixed-method	Questionnaire	Kendall's W coefficient T-test Wilcoxon signed-rank test Kolmogorov-Smirnov test

5.2 What were the purposes of the peer feedback studies?

As summarized in Table 2, three out of ten of the analysed papers aimed to explore students' perceptions of the feedback approach. Three of these review studies had specific goals for improvement in writing performance (n=2) and communication skills (n=1). Two studies had the objective of comparing groups, while the other two were aimed at evaluating the relationship between peer feedback and emotional intelligence (n=1) and the relationship between peer feedback and lecture quality (n=1).

Table 2. Objectives and conclusions of included publications

Authors & Year	Title	Sample	Article Aims	Conclusions
Afrasiabi, M., & Khojasteh, L (2015)	The Effect of Peer-feedback on EFL Medical Students' Writing Performance	59 medical students	Investigate the effect of peer-feedback on writing performance of medical students	The results indicate that there is a positive relationship between peer-feedback and the improvement of the writing performance. This research couldn't find any significant relationship between the gender and writing performance of the students.
Bevan, J., Russell, B., & Marshall, B (2019)	A new approach to OSCE preparation – ProSCEs	32 second year medical students	Improve student's perceptions about providing feedback.	ProSCEs developed a positive environment in which to practise clinical skills. This format was shown to improve confidence, expected performance and guide revision in advance of a summative OSCE.
Daniels, S., & Richards, R (2016)	From autopsy to autonomy in writing centres: postgraduate students' response to two forms of feedback in a health professions education module	9 students from medical and allied health disciplines	Compare the feedback received in a writing consultation to the feedback received from the class group members.	Peer feedback from both a class group member as well as a writing consultant was experienced as useful.
De la Cruz, M. S., Kopec, M. T., & Wimsatt, L. A (2015)	Resident Perceptions of Giving and Receiving Peer-to-Peer Feedback	29 residents	Explored the perceptions of residents involved in peer-to-peer feedback.	Residents perceived feedback as important and offered actionable suggestions to enhance accuracy, usefulness, and application of the information shared
Hunukumbure, A. D., Smith, S. F., & Das, S (2017)	Holistic feedback approach with video and peer discussion under teacher supervision	7 medical students	To explore students' perception on this holistic feedback approach and to investigate ways of maximising effective feedback and learning	The study has demonstrated many potential benefits of this holistic feedback approach with video-based self-reflection and peer discussion with students engaging at a deeper cognitive level than the standard descriptive feedback
Kistler, E. A., Chiappa, V., Chang, Y., & Baggett, M (2021)	Evaluating the SPIKES Model for Improving Peer-to-Peer Feedback Among Internal Medicine Residents: a Randomized Controlled Trial	124 internal medicine residents	To determine if a brief educational intervention focused on the SPIKES framework improves peer feedback between internal medicine trainees on inpatient medicine services as compared to usual practice.	A brief educational intervention focused on SPIKES increased PGY1 perception of the extent, specificity, and satisfaction with feedback from PGY2s
Nagoshi, K., Zaidi, Z., Wright, A., & Stalvey, C. (2019)	Peer-assisted feedback: A successful approach for providing feedback on United States Medical Licensing Exam-style clinical skills exam notes in the United States	135 second-year students and 132 third-year students	To evaluate whether Peer-assisted learning on clinical skills examination notes could provide constructive, beneficial feedback that would help students improve note-writing in the future from the students' perspective.	Peer-assisted learning was a successful method of providing feedback on student CSE notes, especially for third-year students.
Perera, J., Mohamadou, G., & Kaur, S. (2010)	The Use of Objective Structured Self-Assessment and Peer-Feedback (OSSP) for Learning Communication Skills: Evaluation Using a Controlled Trial	202 medical students.	To assess the impact of use of self assessment and peer feedback for improved learning of CS.	Objectively structured self-assessment and peer feedback promotes effective communication skills learning and learner acceptability is high.
Raut, A. V., & Gupta, S. S (2019)	Reflection and Peer Feedback for Augmenting Emotional Intelligence among Undergraduate Students: A Quasi-experimental Study from a Rural Medical College in Central India	94 medical students	To assess the effect of reflection and peer feedback on EI scores among undergraduate medical students	Personal introspection methods such as self-reflection and peer feedback help to improve the EI of undergraduate students.
Sterz, J., Höfer, S. H., Bender, B., Janko, M., Adili, F., & Ruessler, M. (2016)	The effect of written standardized feedback on the structure and quality of surgical lectures: A prospective cohort study	4 surgeons (peers) and 3 undergraduate medical students.	To determine the impact on the lecture quality using written structured feedback and to compare the ratings of surgical lectures between students and surgical peers.	Structured written feedback provided by trained peers and students that is subsequently discussed by the lecturers concerned is a highly effective and efficient method to improve aspects of lecturing.

5.3 What are the challenges of implementing peer feedback in educational settings?

The studies mentioned above have helped us identify five key obstacles and difficulties that arise when implementing peer feedback in educational contexts related to health education in higher education.

5.3.1 Time and Energy Requirements

Almost every paper mentions that effectively implementing peer feedback demands a significant investment of time and energy from both educators and students. This includes preparation, training, ongoing monitoring, and providing support to ensure quality (Afrasiabi & Khojasteh, 2015; de la Cruz et al., 2015; Kistler et al., 2021; Nagoshi et al., 2019; Perera et al., 2010). Studies like those by Afrasiabi and Khojasteh (2015) emphasize that considerable time is needed to train students on how to provide effective feedback. This training involves teaching the principles of constructive criticism, guiding students on how to communicate feedback positively, and providing continuous support throughout the process. The busy schedules of medical residents, whether in De la Cruz's study and colleagues (2015) or Kistler and colleagues' (2021), made it challenging to allocate sufficient time for peer feedback activities.

5.3.2 Quality and Reliability of Feedback

The quality and reliability of peer feedback can vary greatly. Issues such as negative criticism, inaccurate feedback, dishonest comments, and lack of trust in peer feedback can undermine the learning process and the effectiveness of feedback (Bevan et al., 2019; Daniels & Richards, 2016; Kistler et al., 2021; Perera et al., 2010). Perera et al. (2010) state that the quality of feedback can vary greatly depending on the individual providing it. Some participants may lack the skills or knowledge necessary to give effective feedback, leading to unhelpful or misleading comments. Poor examiner feedback and poor quality of feedback were reported by some students in Bevan J. and colleagues' work (2019) while Daniels, S. and Richards, R. (2016) noticed a degree of confusion and a lack of knowledge among some of the students about what to expect from a feedback session.

5.3.3 Emotional and Psychological Barriers

Emotional discomfort and psychological concerns, such as fear of negative judgment, anxiety about public scrutiny, and fear of damaging relationships, can hinder both giving and receiving feedback (Daniels & Richards, 2016; de la Cruz et al., 2015; Hunukumbure et al., 2017; Nagoshi et al., 2019). Hunukumbure et al. (2017) concluded that receiving and giving feedback can evoke negative emotions. Concerns about criticism affecting future working relationships and the potential for retribution or punitive actions can deter students from engaging fully in the feedback process. Nagoshi et al. (2019) realized students simply did not feel confident providing feedback to their peers and Daniels, S., & Richards, R. (2016) showed that the type of relationship the student had with the person providing the feedback influenced how feedback was received. The study from de la Cruz and coworkers (de la Cruz et al., 2015) also observed that the hierarchical nature of medical residency programs created additional barriers, with junior residents feeling particularly uncomfortable providing feedback to senior residents. This dynamic is further complicated when feedback is non-anonymous, as the potential for direct confrontation increases, leading to emotional discomfort and reduced participation.

5.3.4 Lack of Training and Preparation

A lack of sufficient training on how to provide and receive constructive feedback is a common challenge. Studies by Daniels and Richards (2016) and Nagoshi et al. (2019) indicate that inadequate training can lead to confusion and a lack of clarity regarding the role of feedback and the expectations associated with it. Without proper training, students may struggle to provide specific, actionable, and constructive feedback.. They might resort to vague or overly positive comments to avoid conflict or criticism, which undermines the feedback's purpose. Training requirements for effective feedback are also mentioned by Raut and Gupta (2019), Hunukumbure and colleagues (2017), and Afrasiabi and Khojasteh (2015).

5.3.5 Cultural, Social, and Interpersonal Dynamics

The social dynamics and cultural contexts within the educational environment can influence how feedback is perceived and delivered. Issues like hierarchical structures, peer biases, and social dynamics can affect the authenticity and reception of feedback. The hierarchical structures within educational settings can create power imbalances, where students feel uncomfortable providing feedback to those in higher positions (de la Cruz et al.,

2015). This discomfort can lead to feedback that is less honest or constructive, as students may prioritize maintaining professional relationships over offering critical feedback. Daniels and Richards's study (2016) allow us to understand clear differences in issues of authority, power and whose advice was valued. Hunukumbure and colleagues (2017) noted the term "feedback" itself can have varying socio-cultural meanings among students. Some may view it negatively or feel that it implies taking on a teacher's role, which can hinder open and honest peer discussions. The authors also alert that watching peers' performances can create a competitive environment. Students may feel pressure to perform better or may become discouraged if they perceive themselves as less competent compared to others. Finally The historically and culturally formed relationships between teachers and students can influence how feedback is perceived and given. Students may struggle to navigate these dynamics when stepping into a peer feedback role.

5.4 What are the benefits of incorporating peer feedback in the educational curriculum?

While there are significant challenges involved in implementing peer comment as pedagogical strategy, the analyzed articles also demonstrated several benefits.

5.4.1 Enhancement of Critical Thinking and Communication Skills

Peer feedback encourages students to engage in higher-order reasoning and cognitive thought, as they must analyze and evaluate their peers' work critically. It promotes a deeper approach to learning, moving beyond surface-level understanding to more comprehensive engagement with the materia (Afrasiabi & Khojasteh, 2015; Hunukumbure et al., 2017).

Studies have shown that peer feedback can significantly improve students' writing performance, as it provides opportunities for reflection and revision based on peer input (Afrasiabi & Khojasteh, 2015; de la Cruz et al., 2015). In medical education, peer feedback has been found to enhance communication skills, which are crucial for effective patient interact (Perera et al., 2010).

5.4.2 Social and Emotional Benefits

Peer feedback serves as a socializing force, improving interpersonal relationships and related skills among students. Engaging in peer feedback can reduce students' anxiety about

their work, as they receive constructive input from peers rather than solely from instructors (Bevan et al., 2019; Nagoshi et al., 2019; Raut & Gupta, 2019). It fosters a collaborative environment and can also boost motivation and self-esteem, as students feel more involved and responsible for their learning process (Bevan et al., 2019; Raut & Gupta, 2019; Sterz et al., 2016).

5.4.3 Promotion of Reflective Practice and lifelong learning skills

The process of giving and receiving feedback encourages reflective practice, helping students to become more self-aware and self-regulated learners. This reflective practice is crucial for lifelong learning, as it enables students to continuously assess and improve their skills and knowledge (Perera et al., 2010).

5.4.4 Shift Towards Formative Assessment

Peer feedback is often integrated into formative assessment practices, emphasizing learning and improvement over summative evaluation. This shift can lead to a more dynamic and interactive assessment design, focusing on student development rather than solely on final outcomes (Daniels & Richards, 2016; Hunukumbure et al., 2017).

5.4.5 Positive Learning Environment

Peer feedback contributes and can be a strategic tool to ProSCEs, fostering a supportive atmosphere for students to practice clinical skills, which significantly improved their confidence and expected performance in summative OSCEs. This positive environment was crucial for guiding students' revision efforts prior to their exams (Bevan et al., 2019). Peer feedback can be integrative in a model as SPIKES which significantly enhances the quality and satisfaction of feedback among internal medicine residents, contributing positively to their educational experience and professional development. The findings support the integration of structured feedback models in residency training programs to meet educational goals effectively (Kistler et al., 2021).

6 Discussion

The introduction of the European Higher Education Area has put the student at the center of the learning process. This framework has highlighted the necessity to match assessment activities with learning outcomes (Biggs, 2004). However, most students' assessment activities in higher education are designed and conducted by university staff and rarely are students given responsibility for the evaluative process (Giles et al., 2004).

As part of the constructivist approach to education, feedback is considered a key component of the learning and assessment activity for the reflective construction of knowledge and lies in a transformed role for students in feedback and in a variety of forms: in targeting, generating, and interpreting feedback, as well as in communicating and engaging with it (Hounsell, 2007).

Among the several forms of feedback, peer-feedback seems to be especially helpful for the student's learning, eloquently expressed by Boud, Falchikov and Hattie in a series of studies (Boud et al., 2013; Falchikov, 2013; Hattie & Timperley, 2007) emphasising the students' involvement in the process of feedback and recognizing the significant part of feedback for higher-quality learning outcomes to be achieved.

Peer-feedback is a kind of process in which students give feedback to, or receive feedback from their peers. In the educational context, this can happen in various forms such as giving feedback to a peer's research report, providing qualitative feedback on a classmate's presentation, or evaluating a fellow trainee's professional task performance (Topping, 1998).

The findings of our scoping review align with existing educational theories emphasizing the social and constructivist nature of learning. Peer feedback fosters self-regulation and metacognition, as highlighted in the works of Butler and Winne (1995) and Hattie and Timperley (Hattie & Timperley, 2007). By engaging in reflective practice and providing qualitative feedback, students not only improve their peers' performance but also enhance their critical thinking and evaluative skills. This brings into line with the principles of formative assessment, which prioritizes learning over mere performance measurement (Nicol & Macfarlane-Dick, 2006; Yorke, 2003).

Moreover, peer feedback complements the role of instructors by creating a participatory environment where students take greater ownership of their learning. The process of evaluating peers' work and receiving constructive criticism allows students to deepen their understanding of content and develop essential life-long learning skills. This reflects the shift towards more student-centred pedagogies that are increasingly valued in higher education.

The integration of peer feedback also has implications for collaborative learning. Peer feedback creates opportunities for students to engage in meaningful interactions, enabling the co-construction of knowledge. These interactions help students internalize learning standards and develop a shared understanding of academic and professional expectations. This co-regulatory process underscores the dynamic interplay between individual learning and collective improvement (Carless & Boud, 2018; Nicol et al., 2014).

Furthermore, the incorporation of peer feedback aligns with the broader goals of evidence-based education. The iterative process of giving and receiving feedback helps students internalize evidence-based practices, which are critical in clinical disciplines like osteopathy. These findings echo the growing emphasis on active, student-centered learning frameworks in health education (MacMillan et al., 2023).

Looking at the classroom, peer feedback offers numerous benefits for students, including improved communication, critical thinking, and interpersonal skills. It fosters a collaborative learning environment and shifts the focus from instructor-led evaluations to peer-to-peer interactions. This transformation is especially relevant in medical sciences where practical skills and patient communication are paramount (Carless et al., 2011; Gielen et al., 2010; Shute, 2008).

From an institutional perspective, integrating peer feedback into the curriculum can reduce the burden on instructors while enriching the student learning experience. Given the increasing pressures on academic staff in health education to provide timely and personalized feedback, peer feedback emerges as a sustainable alternative. It not only increases the frequency and timeliness of feedback but also diversifies the perspectives students receive, making the learning experience more holistic (Boud & Molloy, 2013; Nicol & Macfarlane-Dick, 2006).

Despite its benefits, challenges such as variability in feedback quality, emotional discomfort, and time constraints must be addressed. Effective implementation requires structured training for students and faculty to ensure feedback is constructive and actionable. Initiatives like peer physical examination practices at Victoria University and structured feedback models like SPIKES demonstrate promising frameworks for integrating peer feedback into health education curricula (Afrasiabi & Khojasteh, 2015; Kistler et al., 2021; Sterz et al., 2016).

Osteopathic education stands to benefit significantly from the incorporation of peer feedback. The emphasis on holistic care and manual therapy in osteopathy aligns with the principles of collaborative and reflective learning. Peer feedback can enhance students'

diagnostic and therapeutic skills by encouraging active engagement and continuous self-assessment.

By embedding peer feedback into osteopathic training, students can develop a greater sense of accountability and professionalism. The collaborative nature of peer feedback mirrors the interdisciplinary teamwork required in healthcare, preparing students for real-world clinical settings. Moreover, the iterative feedback process aligns with the osteopathic philosophy of continuous improvement and adaptation, fostering an environment of lifelong learning.

The findings also suggest that peer feedback can address gaps in current osteopathic educational practices. For instance, peer feedback provides a mechanism for students to practice and refine their skills in a low-risk, supportive environment. This is particularly beneficial for developing manual techniques and communication strategies, both of which are critical for patient-centered care

Moreover, integrating peer feedback into osteopathic curricula addresses the gaps identified in current educational practices, such as inadequate preparation for clinical practice and limited exposure to evidence-based methodologies. By fostering a culture of continuous learning and feedback, osteopathic programs can better equip graduates to meet the evolving demands of healthcare.

7 Conclusion

This scoping review demonstrates that peer feedback is a valuable pedagogical tool in health higher education, with significant potential to enhance learning and performance. By fostering critical thinking, reflective practice, and interpersonal skills, peer feedback aligns with the goals of evidence-based and student-centred education.

In the context of osteopathic education, peer feedback can address existing gaps by promoting active learning and collaborative skill development. However, successful implementation requires addressing challenges related to training, feedback quality, and emotional barriers.

By adopting structured peer feedback frameworks and prioritizing formative assessment, osteopathic and other medical sciences programs can enhance the preparation of graduates for clinical practice. To advance the field, future research should explore innovative methods for integrating peer feedback into health education and evaluate its impact on professional competencies.

Peer feedback represents a critical step forward in aligning medical science education with contemporary educational paradigms. By bridging the gap between theory and practice, it fosters a culture of continuous improvement, preparing students for current demands in dynamic healthcare environments. As health education continues to evolve, peer feedback will undoubtedly play a pivotal role in shaping the next generation of skilled and reflective practitioners.

7.1 Limitations and Future Directions

This review has several limitations, including the small number of studies reviewed and the heterogeneity of methodologies and outcomes. Most studies were conducted in controlled academic settings, limiting the generalizability of findings to diverse educational and clinical environments. Additionally, the lack of specific studies on peer feedback in osteopathy highlights a critical gap in the literature.

Future research should focus on longitudinal studies to assess the long-term impact of peer feedback on learning outcomes and professional practice. Moreover, qualitative studies that capture the nuanced experiences of students and educators with peer feedback can provide deeper insights into its implementation and impact.

By addressing these challenges and expanding the evidence base, peer feedback can be effectively integrated into health education, ultimately improving the quality of training and patient care in osteopathy and beyond.

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