




BMJ Open Gross and applied anatomy pedagogical approaches in occupational therapy education: protocol for a scoping review

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ABSTRACT

Introduction Historically, dissection is considered the ‘gold standard’ for teaching foundational anatomy to student occupational therapists. However, many programmes no longer have access to gross anatomy laboratory resources, as it is considered too costly. To address this limitation, applied anatomy instructors have developed innovative novel approaches to teach gross and applied anatomy to student occupational therapists, including live/surface anatomy, medical imaging, and more recently, computer-aided instruction. The types of different anatomy pedagogical approaches used and their impact on learning outcomes in occupational therapy education are unclear. The purpose of this scoping review is to map the types of musculoskeletal gross and applied anatomy pedagogical approaches used in occupational therapy curricula.

Methods and analysis Using Arksey and O’Malley’s (2005) six-stage scoping review framework, approximately 304 different search combinations will be searched across five electronic library databases (ie, MEDLINE, Embase, CINAHL, AMED and ERIC) from their inception to December 2021, in addition to conducting consultation exercises with relevant stakeholders. After title/abstract and full-text screening, included articles will be charted, collated and summarised.

Ethics and dissemination This study will not involve human or animal subjects. Therefore, research ethics approval is not required. The proposed scoping review will help the research, institutional and clinical rehabilitation communities to better understand the types of musculoskeletal gross and applied anatomy pedagogical approaches used to foster, build and promote musculoskeletal foundational knowledge in occupational therapy education. This could potentially inform the future physical medicine course curricula in occupational therapy programmes. The findings of this review will be disseminated to occupational therapy instructors, occupational therapists, researchers and organisations offering occupational therapy programmes (eg, Universities).

INTRODUCTION

Occupational therapy is a type of health profession involving the use of assessment and intervention to develop, recover or maintain the meaningful activities, or occupations,

Strengths and limitations of this study

- ⇒ This review will be conducted rigorously and transparently using Arksey and O’Malley’s (2005) framework for undertaking scoping reviews.
- ⇒ The proposed review will also involve consultation exercises with stakeholders (Arksey and O’Malley’s optional sixth step), which will maximise the applicability of our findings to occupational therapists and institutions across Canada.
- ⇒ There is a risk of language bias given that only articles in English will be included in the review, given that the review team can only read, write, speak and understand English.
- ⇒ The consultation exercises used in this scoping review capture prerequisites and curriculum materials used to teach musculoskeletal gross and applied anatomy to occupational therapists within the Canadian context only, and as such, curriculum materials from other geographical areas will not be captured during this review.
- ⇒ There is no set time limit being placed on publications considered for inclusion in this scoping review, and as a result, earlier literature included in the final review may not reflect current evidence-based practices.

of individuals, groups or communities.¹ The Canadian Model of Occupational Performance and Engagement (CMOP-E) is a conceptual model of the key elements of occupational performance and engagement,² with occupational performance being defined as ‘observable aspects of doing or how an occupation is carried out’.³ This model outlines interactions between the person (ie, affective, cognitive, physical, spiritual), occupation (ie, self-care, productivity, leisure) and environment (ie, physical, institutional, cultural, social). The CMOP-E also moves beyond performance to acknowledge engagement for those whose goals or capabilities are not performance. Occupational therapists are trained to understand not only the medical and physical limitations of a

disability or injury but also the psychosocial factors that affect the functioning of the whole person.¹ Occupational therapists are university educated professionals who apply their specialised knowledge and skills to recommend a course of preventive or corrective action to help people lead more productive and satisfying lives.¹ Occupational therapists generally work in a variety of settings, including home and community care, institutions (eg, hospitals), government and industry/business.

From a theoretical standpoint, the focus of occupational therapy education in teaching its core tenets has evolved and shifted alongside the changing landscape of healthcare. For example, the profession is grounded in occupation at its core, but began to shift to a biomedical lens during World War I and II, when physical rehabilitation became a priority to address the needs of soldiers returning from war.⁴ As a result, a strong emphasis on human anatomy and physiology was introduced to occupational therapy education during this period. As time progressed, the pendulum swung back to focus on and build the body of knowledge in occupational science, with a particular emphasis on human occupation from a holistic perspective of person (ie, spirituality, cognitive, physical, affective) and environment (ie, physical, social, cultural, institutional) standpoints.⁵ While important to place priority on the scholarship of its own disciplinary science, to some degree, this involved a shift away from foundational knowledge in the biomedical sciences. However, more recently, a need for occupational therapy education to balance priorities in both biomedical and occupational sciences has been voiced.⁶ This time, the shift comes with a particular emphasis on foundational skills of physical medicine, combined with a holistic understanding of interactions of person, environment and occupational factors.⁷

Physical medicine is hereby defined as the branch of medicine that treats biomechanical disorders and injuries, as well as neurological conditions. Foundational skills in physical medicine in occupational therapy include applied anatomy, human biomechanics and musculoskeletal functions.⁸ Most typically, curriculum in occupational therapy include foundational courses in physical medicine, including neurological and musculoskeletal areas of practice, at the onset of the programme. The focus of this scoping review is on the musculoskeletal area of practice within physical medicine and rehabilitation. For example, as part of the Master of Science in Occupational Therapy (MScOT) curriculum at the University of Toronto, students in the Department of Occupational Science and Occupational Therapy take a course regarding the 'Musculoskeletal Foundations for Occupational Therapy Practice' (OCT1152Y) on entry into the programme. This course focuses on the structure (anatomy) and function (physiology) of the musculoskeletal systems of the upper and lower extremities and the trunk, as it relates to engaging in meaningful occupation. Foundational knowledge for understanding selected musculoskeletal conditions and for developing

basic clinical skills (eg, goniometry, manual muscle testing) are addressed. The use of lectures and laboratory-based pedagogies has been used to teach the gross and applied anatomy component of this course, until 2020, when learning was pivoted online because of the COVID-19 pandemic. As a result, online pedagogies were implemented, and new course materials were rapidly developed. Amid this rapid implementation, the need to map and evaluate the gross and applied anatomy pedagogical approaches used in occupational therapy education became evident.

Pedagogy is described as the method and practice of teaching, especially as an academic subject or theoretical concept. Gross and applied anatomy pedagogical approaches in occupational therapy education are changing, particularly with the introduction and rapid evolution of technology.⁹ Historically, dissection, which involves thorough surgical examination of deceased human tissues, used to be considered the 'gold standard' for teaching foundational anatomy to student occupational therapists. Prosection involves thorough examination of sections of the body, which have been previously dissected. However, these methods are not without drawbacks, such as the colour, texture and smell of the body being 'unlifelike', the lack of ability to palpate or ask the cadaver to change position, ethical and legal issues, and expenses of maintaining a cadaveric facility.¹⁰ Further, many programmes no longer have access to gross anatomy laboratory resources, as it is considered too costly.¹¹ To address these limitations, applied anatomy instructors have developed several creative and novel approaches to teach gross and applied anatomy to student occupational therapists, including live/surface anatomy (ie, visual observation, palpation, auscultation—investigated through various approaches, including peer examination, life models, body projection and body painting), medical imaging (ie, MRI, X-ray, CT scan and ultrasound) and more recently, computer-aided instruction (CAI; for example, videos, apps and virtual reality).^{8 12} The effectiveness of the different anatomy pedagogical approaches in occupational therapy education is unclear.^{10–12} Meanwhile, occupational therapy practitioners laud the need for continued laboratory pedagogies with examples of how inadequate application of anatomy knowledge negatively affect practice.^{13 14} This highlights a need to better understand the pedagogical approaches used to teach foundational skills related to gross and applied anatomy to student occupational therapists, in order to inform physical medicine curriculum development in occupational therapy programmes across Canada.

Purpose of the review

Broadly, the purpose of this scoping review is to map the types of musculoskeletal gross and applied anatomy pedagogical approaches used in occupational therapy curriculum.

METHODS AND ANALYSIS

This scoping review will use Arksey and O'Malley's¹⁵ six-stage scoping review framework, which was built on by others.^{16 17} This six-stage scoping review process involves: (1) identifying a research question; (2) identifying relevant studies; (3) study selection; (4) charting the data; (5) collating, summarising and reporting the results; and (6) an optional sixth step of 'consultation with stakeholders', which will be undertaken to the fullest extent possible. Our stakeholder engagement methods will include a consultation exercise with gross and applied anatomy instructors from occupational therapy programmes across Canada as an integrated knowledge translation strategy.

Step 1: identifying the research question

The first step in Arksey and O'Malley's¹⁵ scoping review framework is to identify a research question or questions. The present scoping review will address the primary research question of: 'What are the pedagogical approaches used to teach foundational skills in musculoskeletal gross and applied anatomy to student occupational therapists?'

The review will also address four secondary questions:

1. What factors (eg, type of anatomy, type of technology) are related to pedagogical approaches used in occupational therapy programmes?
2. What are the common pedagogical approaches used historically (eg, dissection, prosection), and what are we moving towards (eg, virtual reality)?
3. Why is it important to consider new pedagogical approaches that use computer-assisted innovation (eg, resources, feasibility, etc)?
4. What is the effectiveness/outcomes of the different pedagogical approaches used?

These specific research questions were initially developed by the review team and may be later refined in collaboration with an institutional librarian from the University of Toronto. Broadly, this review question will be used to pinpoint specific pedagogical approaches that are used to teach occupational therapists educational content regarding musculoskeletal gross and applied anatomy.

Step 2: identifying relevant studies

The second step in the six-stage scoping review framework¹⁵ is to identify relevant studies. This will be done by systematically applying approximately 304 different search combinations (19 population terms × four concept terms × four context terms) across five electronic databases accessible through the University of Toronto library, including

MEDLINE (via Ovid), Embase (via Ovid), CINAHL (via EBSCO), AMED (via Ovid) and ERIC (via Ovid). To search each database, a strategy based on the Population Concept Context model¹⁷ will be used (see table 1). For the population, a variety of occupational therapy student-related programmes, such as BScOT, MScOT and OTD will be investigated. For the concept, foundational skills related to musculoskeletal gross and applied anatomy will be examined. Finally, for the context, occupational therapy as a discipline will be explored.

Each term listed under each respective heading (eg, population terms) will be combined using 'OR' and all terms within each heading will be combined across headings using 'AND'. Where possible, search terms will be exploded to include as many synonym terms as possible, to ensure that all word variations are captured. Of course, exact word variations will be adapted to each specific database searched to account for discrepancies/differences in database 'language' (see online supplemental file 1, for example, database searches/yields). Searching will be undertaken by one member of the review team, in consultation with an institutional librarian from the University of Toronto. Hand searches of retrieved articles (eg, checking reference lists of review articles) will be completed to generate additional results. Additionally, grey literature will also be reviewed for potential inclusion in the review. This includes searching databases of ongoing research (eg, clinical trial registries), conference proceedings and abstracts (eg, Canadian Association of Occupational Therapists, Ontario Society of Occupational Therapists), dissertations and theses, project reports, government documents, practice guidelines, and published Canadian university curriculum documents.

Prior to officially undertaking the formal search, the search terms and strategy will be piloted in one database (eg, MEDLINE) to determine whether the search terms and strategy cast a net of an appropriate nature. The search strategy will then be refined based in consultation with an institutional librarian from the University of Toronto, based on this pilot trial. For example, if it is found that the pilot search yields a very large number of articles, making timely completion of the review unfeasible, the search strategy will be narrowed in collaboration with the review team, relevant stakeholder groups and an institutional librarian from the University of Toronto. Conversely, if it is found that the pilot search strategy yields very little, synonym terms and term explosion will be revisited in collaboration with the review team, relevant stakeholder groups and an institutional

Table 1 Proposed search strategy

Population terms (n=19)	Concept terms (n=4)	Context terms (n=4)
teaching/, pedagog*, learn*, instruct*, educat*, train*, graduat*, undergraduat*, student/, health occupations/, trainee*, student*, learner*, intern*, resident*, MScOT, BScOT, DipOT, OTD	anatomy/, structure adj3 function, gross anatomy, applied anatomy	occupational therapy/, occupational adj3 therap*, occupational science, OT

librarian from the University of Toronto. Once the final search strategy has been confirmed through pilot testing, the formal search will be run across the five databases. Search results from across the five databases will be exported to Covidence,¹⁸ where deduplication will then be conducted to remove matching publications, before title and abstract screening, which will take place using the Covidence screening and data extraction software.¹⁸ All retrieved articles through database searching and handsearching, as well as the number of duplicates that are removed, will be tracked using Covidence¹⁸ and displayed using a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram,¹⁹ which has been recently adapted specifically for scoping reviews (ie, PRISMA-ScR).²⁰

Step 3: study selection

Step three of the six-stage scoping review framework¹⁵ is to select relevant publications, which will be achieved by screening each article against the inclusion and exclusion criteria for the scoping review. In order to be included in the present scoping review, articles must meet the following criteria: (1) available in English full text; (2) empirical research, featuring any study design and/or grey literature (eg, practice guidelines); (3) features a pedagogical approach used to teach musculoskeletal gross and applied anatomy; (4) population targeted by the pedagogical approaches are student occupational therapists; and (5) published within any timeframe (ie, no time limit will be applied). No set time limit is being placed on the literature considered for inclusion in this scoping review, given that the review aims to map the entire breadth and depth of the literature, from inception to the date of searching. Studies written in English only were chosen given that the review team can only read, write, speak and understand English.

Articles that focus on biomechanics and physical medicine solely, without focus on anatomy, will be excluded from the review. Studies will be screened using the data management software Covidence¹⁸ for tracking and comparability purposes. The final breakdown of studies reviewed, excluded and included in the scoping review will be presented in the final report using the PRISMA-ScR diagram.²⁰ Reasons for excluding articles at the full-text level will also be included in this flow diagram.

First, two independent reviewers will be responsible for screening all retrieved database hits at the title and abstract level. Both reviewers will be second year MScOT graduate students trained by the first author and the senior author, both of whom are trained researchers who have published scoping reviews before. Title and abstract screening will be undertaken using the Covidence software.¹⁸ Reasons for excluding particular articles at the title and abstract level (eg, pedagogical approach does not pertain to musculoskeletal gross and applied anatomy) will be determined by weighing each article against the inclusion and exclusion criteria of the review. Covidence¹⁸ has the ability to identify areas of agreement, as well as

areas of discrepancy, between multiple reviewers. As such, discrepancies identified through Covidence¹⁸ will be resolved through discussion between the two reviewers, with the option of bringing in a third reviewer (eg, the principal investigator) if the two reviewers cannot achieve consensus on their own. If a reviewer is unsure of whether an article meets the eligibility criteria based on the title and abstract alone, the article will be included in the full-text screening process to ensure that potentially relevant literature is not excluded.

Next, the two reviewers will be responsible for independently reviewing all full-text articles that pass title and abstract screening, to objectively determine whether to include or exclude the literature from the final review. After all full-text articles have been reviewed, the two reviewers will meet to discuss their choice regarding each full-text article (ie, include vs exclude) and their reason(s) for making this choice. If disagreement occurs between the two reviewers with regard to including or excluding a particular article, a third reviewer will be brought in, asked to review the article in full, and resolve the discrepancy. To screen full-text articles, both reviewers will use the Covidence screening and data extraction software.¹⁸

Reasons for excluding particular articles at the full-text level (eg, population targeted is not student occupational therapists) will be determined by weighing each article against the inclusion and exclusion criteria of the review. Reasons for exclusion will be tracked using Covidence¹⁶ and later amalgamated and presented in the PRISMA-ScR diagram²⁰ for transparency of reporting. Tools and software including Covidence¹⁸ and Microsoft Excel²¹ will be used by the review team for study and reference management including deduplication, screening and data extraction.

Step 4: charting the data

The fourth step in the scoping review framework¹⁵ involves charting the data from the included full-text studies. First, a data extraction form will be developed, piloted and iteratively revised after reading through a few key articles and reclassifying our coding scheme. Examples of information to be extracted from the included articles may consist of publication details (ie, author and year), study design, pedagogical approach employed, specific anatomy content being taught (eg, gross and/or applied anatomy), type of learning (eg, in person, online, hybrid, etc), programme outcomes, student outcomes, cost and resources. Data will be extracted from each article and synthesised using descriptive analysis (eg, '60% of the studies prescribed 'X' pedagogical approach'). If specific information is not available from an article, the review team will attempt to contact the study authors to retrieve this information. Specific information extracted from each eligible article will paint a comprehensive picture of the breadth and depth of research in this topic area, as well as identify any potential gaps in this area of knowledge.

Data from the included articles will be extracted into a comprehensive format using Microsoft Excel.¹⁹ Given that the proposed review is scoping in nature, rather than systematic, a quality appraisal and/or risk of bias assessment of the included literature will not be undertaken. Scoping reviews are meant to systematically map the breadth and depth of the literature on a given topic (ie, pedagogical approaches employed to teach musculoskeletal gross and applied anatomy content to student occupational therapists), rather than to assess the quality of the existing literature.^{13,20} Similarly, given that the quality of the evidence identified through this review is not being appraised, articles will not be graded according to the ‘strength’ of the evidence (eg, randomised controlled trial vs observational study).

Step 5: collating, summarising and reporting the results

Step five of the scoping review framework¹⁵ involves collating, summarising and reporting the results. This includes organising the main study details into a table, and extracting descriptive data from across the studies, such as frequencies and percentages. This step will be undertaken by one member of the review team using Microsoft Excel.²¹ Data that support both primary and secondary research questions will be collated, summarised and reported in this manner. These data will be used to paint a comprehensive picture of the breadth and depth of the literature regarding the types of pedagogical approaches used to teach musculoskeletal gross and applied anatomy content to student occupational therapists, as well as identify any potential gaps in knowledge (eg, ‘80% of studies did not report the frequency of learning sessions’). Gaps in knowledge identified by the proposed review will be used to provide reporting recommendations, as well as foster future research investigations regarding this topic area (eg, comparing the effectiveness of different pedagogical approaches).

Step 6: consultation with stakeholders

Finally, the scoping review team will undertake the optional sixth step of consultation with relevant stakeholder groups,¹⁵ to the fullest extent possible. These groups include: (1) academic institutions (eg, Universities); (2) occupational therapy programme gross and applied anatomy instructors; and (3) other researchers who have an interest in this topic area. Stakeholder groups will be involved throughout the review process as much as possible to ensure that the methods undertaken to pursue the review, as well as the findings of the review, are relevant and applicable to academic research, occupational therapy programme development and clinical practice. This process will involve asking stakeholders (eg, occupational therapy programme gross and applied anatomy instructors) from across Canada to provide us with their published curriculum documents (eg, course outline), which contain a course description, objectives, evaluation methods and teaching approaches (eg, labs,

lectures) of the course that covers content on applied anatomy, biomechanics or similar foundational concepts.

We will also host a consultation exercise via email with stakeholders to obtain information on anatomy prerequisites to occupational therapy programmes across Canada, as prerequisites may affect how the courses within the occupational therapy programmes are taught. For example, some Canadian Universities (eg, University of Ottawa) have admission requirements, which include an anatomy course. Whereas, students admitted to some MScOT programmes (eg, University of Toronto) have degrees in the arts and/or humanities, without formal anatomy education. Prerequisites course requirements will have an influence on what is taught regarding anatomy in year one of the respective occupational therapy programmes.

Finally, we will consult with relevant stakeholders via email once we have extracted the data from the included review articles to acquire their feedback on the findings on both our primary and secondary research questions. Through these consultation exercises, we will also aim to form a collaborative group among this network of instructors invested in gross and applied anatomy education in occupational therapy.

Timeline

The review team will aim to finish the scoping review process as swiftly as possible in order to avoid missing newly published literature and to foster timely dissemination of findings resulting from the review. However, it must be acknowledged that the timeline for this review is dependent on several factors, including the number of articles found when initially searching the databases, the number of articles in which there is discrepancy among the two reviewers, the number of full-text articles to screen and the number of articles included in the final review from which data must be extracted, collated, synthesised and reported. As such, the timeline presented herein is merely an approximation.

First, it is anticipated that the initial search will be run in December 2021. Depending on the number of hits retrieved by the initial search across the databases, it is anticipated that title and abstract screening will take approximately 1–3 months among the two reviewers (eg, January to March 2022). This is based on an estimate of each reviewer being able to screen 100 titles/abstracts per hour. Following this will be the full-text screening, which is expected to take another 1–3 months (eg, April to June 2022), approximately, depending on the number of articles that pass the title and abstract screening process. Next, it is anticipated that extracting the relevant data from the final included articles will take approximately 2 months (eg, July to August 2022) and that collating, summarising and reporting the results will take another month (eg, September 2022). Finally, it is anticipated that writing up the results and implications of the review for dissemination and publication will take approximately 3–6 months.

Anticipated results

Broadly, it is anticipated that the results of this scoping review will help to better understand the types of pedagogical approaches that are used to teach student occupational therapists about musculoskeletal gross and applied anatomy. These pedagogical approaches may inform the development of future approaches used to teach anatomy to student occupational therapists, potentially improving applied knowledge in clinical practice. We anticipate the results of this review to highlight a shift away from laboratory pedagogies and towards CAI, as well as an exposition of programme resource (ie, staff, costs) constraints, and challenges in measuring outcome of translation of learning to clinical practice.

Limitations

Despite the strengths and anticipated contributions of the proposed scoping review, there are a few limitations which must be acknowledged and considered. First, there is a risk of language bias given that only articles in English will be included in the review, given that the review team can only read, write, speak and understand English. It is recommended that future reviews include a multilingual team to broaden the degree to which studies written in other languages (eg, French) can be included in the review.

Second, the consultation exercises undertaken in this review will only capture pedagogical approaches used to teach foundational skills in musculoskeletal gross and applied anatomy to occupational therapists within the Canadian context. As such, it must be acknowledged that stakeholders from other geographical areas (eg, USA) will not be consulted during this review, and therefore, may result in some of the scope of the literature being missed. However, it must be acknowledged that occupational therapy anatomy pedagogy varies substantially between geographical contexts and therefore requires a specific focus on each separate context.

Finally, there is no set time limit being placed on publications considered for inclusion in this scoping review, given that the review aims to map the entire breadth and depth of the literature from inception to the date of searching. As a result, the earlier literature being included in the final review report may not reflect the current evidence-based practices with regard to pedagogical approaches employed to teach musculoskeletal gross and applied anatomy content to student occupational therapists. However, it must be acknowledged that limiting the scope of the literature being included in the review (eg, published within the last 10 years) may result in key material being overlooked, which would diminish the strength of the findings. As per our secondary research question, this paper aims to explore if/how anatomy pedagogies have changed over time. To capture this information, it is necessary to retain all relevant information on this topic area, despite the date in which it was published.

Patient and public involvement

It is not appropriate or possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Ethics and dissemination

This study will not involve human or animal subjects. Therefore, research ethics approval is not required. The findings of this review will be disseminated to relevant stakeholder groups, including occupational therapy instructors, occupational therapists, researchers and organisations offering occupational therapy programmes (eg, Universities). First, the review team will aim to submit the results of the review for publication in peer-reviewed academic journals and professional practice journals, as well as deliver the findings through virtual, local, national and international conference presentations. The research team will also use social media, such as Twitter and Facebook, to target groups who may not have access to academic publishing means. To further reach non-academic groups, we will also ask organisations who support pedagogy, physical medicine and occupational therapists to post short excerpts about the review findings in their e-newsletters and email distribution lists, for dissemination to the wider public. We will also summarise our results into blog posts, which can be posted on websites of relevant organisations. We will also draft summary briefings, lay summaries, posters and pamphlets. Finally, we will host educational seminars/webinars (both in-person and online, depending on the pandemic situation) for the lay public and other relevant stakeholder groups to disseminate our findings. It is anticipated that sharing this knowledge widely will inform curriculum development for other physical medicine courses geared towards occupational therapists. Not only will this benefit occupational therapy instructors, student occupational therapists, and organisations who offer occupational therapy programmes (eg, universities), more broadly, but it will also benefit those who are licensed occupational therapists.

In conclusion, the proposed scoping review will help the research, institutional and clinical rehabilitation communities to better understand the types of musculoskeletal gross and applied anatomy pedagogical approaches that are employed to teach foundational skills in physical medicine to student occupational therapists. This could potentially inform the future physical medicine course curriculum in occupational therapy programmes at U of T and other Canadian universities. This will optimise MScOT student learning outcomes and support applied, evidence-based practice for occupational therapists.

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