

What's out there? Kinesiology curriculum scan for physical activity and older adults in
Ontario (Canada)

Cassidy L. Edlington, BKin

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Faculty of Applied Health Sciences, Brock University
St. Catharines, Ontario

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Abstract

Background: To date, no studies have conducted a curricular scan to evaluate coursework targeting older adults and physical activity in university-based kinesiology departments.

The research question guiding this study was: What percentage of courses taught in kinesiology programs at universities in Ontario (Canada) focus on older adults and physical activity?

Methods: Using a list of universities ($N = 29$) from Ontario (Canada) as the sampling frame, this descriptive study used archival data published within undergraduate calendars by sixteen universities. Data were extracted then coded using a coding manual developed using best practice guidelines for knowledge synthesis research.

Results: Human Biomechanics and Psychomotor Learning/Neuroscience were offered in 100.0% of the undergraduate programs while 81.3% offered a course devoted to older adults and physical activity. Variability in the number of courses targeting older adults and physical activity was evident ($Range = 1.0$ to 4.0 courses; $M = 1.5$ courses; $SD = 1.2$ courses; $Md = 1.0$ courses). Two universities contained one course that focused on physical activity for chronic diseases among older adults.

Conclusions: Overall, this study provides evidence that most universities in Ontario (Canada) offer undergraduate kinesiology courses focused on older adults and physical activity. It is possible that availability of these courses is due to gerontology being an elective course listed within the admission requirements of the College of Kinesiologists of Ontario. Future research may wish to explore the number (i.e., how many?) and type (i.e., class-based vs. field-based, etc.) of courses targeting older adults and physical activity needed for training kinesiology students.

Keywords: Gerontology, Post-Secondary Education, Curriculum Design, Human Kinetics, Exercise Professionals

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Introduction

In Canada, an individual is classified as a ‘senior citizen’ once they reach the age of 65 because this is mandatory retirement age in select fields permitting individuals to collect a pension (Government of Canada, 2021). Statistics Canada (2020a) estimated that in 2020, the population aged 65 years (and older) was 6,835,866 persons (Men: 3,147,625; Women: 3,688,241). Given that Canada’s entire population was estimated at 38,008,005 persons (Statistics Canada, 2021), it seems that senior citizens represented ~17.89% of Canada’s total population. Within Ontario, Statistics Canada (2020a) estimated the population aged 65 years (and older) to be 2,594,358 (Men: 1,176,315; Women: 1,418,043) indicating senior citizens accounted for ~18.53% of the province’s total population. In Canada, this subset of the population-labelled ‘senior citizens’-is predicted to continue increasing ~68% by 2037 (Canadian Institute for Health Information [CIHI], n.d.). Overall, this means that adults classified as ‘senior citizens’ will constitute a larger section of the Canadian population than ‘newborns’ (i.e., aged 0 to 4 years) which increased in size by ~ 6.83% between 2000 and 2020 (Canadian Institute for Health Information [CIHI], n.d.).

Life expectancy in Canada for the year 2017 differed between men (70 to 80 years) and women (73 to 84 years; Canada Protection Plan, 2020). Furthermore, Ontario’s life expectancy for men was 79 to 80 years, and 83 to 84 years for women (Canada Protection Plan, 2020). By contrast, data published by Statistics Canada (2018) indicated that life expectancy from 1920 to 1922 for men (58 years) and women (60 years) was much lower than current estimates. In 100 years, the life expectancy of both male and females has increased by approximately 20 years. What do these data focused on life expectancy and

population changes imply? Overall, adults in Canada live longer and constitute a larger portion of the overall population nationally and provincially in Ontario than in the last century.

The increased life expectancy in Canada has raised concerns due to the corresponding decline in both physical health and mental health that accompanies older age (Lyons et al., 2014). In 2019, Statistics Canada (2020b) listed the following acute and chronic health conditions that impact those aged 65 years (and older) living in Canada: Age-related macular degeneration (AMD), cataracts, diabetic retinopathy, glaucoma, asthma, chronic bronchitis, emphysema or chronic obstructive pulmonary disease (COPD), anxiety disorders, mood disorders, post-traumatic stress disorder (PTSD), Alzheimer's disease, Parkinson's disease, bowel disorders, chronic kidney disease, urinary incontinence, hyperlipidemia, high blood pressure, fibromyalgia, osteoporosis, arthritis, back problems, cancer, chronic fatigue syndrome, diabetes, heart disease, sleep apnea, and/or stroke. These health conditions range in prevalence from 0.8% (Parkinson's disease) to 47.0% (Arthritis) reported by older adults living in Canada (Statistics Canada, 2020b) and typically exhibit different prevalence rates between men and women.

Physical activity-referring to any bodily movement produced by the skeletal muscles resulting in energy expenditure during leisure time (e.g., sport, exercise, active transportation, etc.; World Health Organization, 2020)-has been identified as a key component to healthy living plus an important self-care strategy that can mitigate the negative effects of aging for older adults (Lyons et al., 2014). Previous studies indicate the benefits of physical activity for older adults can accumulate in one of three domains: (1) Physical, (2) Mental, and (3) Social. In terms of physical benefits, Reid and Foster

(2017) reported that vigorous intensity (75 minutes/week) or moderate intensity (150 minutes/week) physical activity could reduce diabetes mellitus (type 2) by 40%, cardiovascular disease by 35%, joint/back pain by 25%, and colon/breast cancer by 20%. In terms of mental health benefits, previous studies with older adults report global quality of life improvements attributed to physical activity (Reid & Foster, 2017) and reduced levels of mental ill-health (e.g., depression, etc.) during the COVID-19 pandemic for older adults engaged in more vigorous physical activities (Callow et al., 2020). Lastly, previous studies have also indicated that physical activity in older adults can result in social benefits. For example, research by Boen et al. (2020) revealed that feeling a sense of safety within society plus engagement in social activities within the previous year were both positively linked with greater physical activity behaviour in older adults.

Building upon research demonstrating the health benefits of physical activity for older adults, the Canadian Society for Exercise Physiology (CSEP) has published guidelines for 24-hour based movement behaviours targeting adults 65 years of age (and older). According to the CSEP (2021), adults 65 years of age (and older) should be physically active daily targeting a weekly accumulation of 150 minutes (or more) of moderate-to-vigorous physical activity to obtain health benefits. In addition, the guidelines published by the CSEP (2021) recommended adults 65 years (and older) perform at least two days/week of strength training, and physical activities (e.g., standing, etc.) which challenge balance using light-intensities to optimize health benefits.

While research supports the health benefits of physical activity for older adults, a few studies highlight problems with initiation or sustained participation in regular physical activity for this cohort. For example, Viken et al. (2019) reported dropout rates

of ~11.0% (12-months post-initiation) and ~14.9% (36-months post-initiation) exhibited by older adults ($M_{\text{age}} = 72.4$ years; $SD_{\text{age}} = 1.9$ years) participating in The Generation 100 Study – a randomized controlled trial comparing supervised physical activity sessions to normative guidelines. Letourneau and Goodman (2014) claim older adults reported many difficulties that could prevent sustained engagement in physical activity and promote sedentary behaviours including lack of interest and limited contact with health-care professionals¹ able to support physical activity behaviour. In Canada, Beauchamp et al. (2018) report that older adults represented the least physically active segment of the population with less than 15% of Canadians aged 65 years (or older) meeting current physical activity recommendations.

Overall, these lines of research support the emergence of a paradox in the literature focused on older adults and physical activity. First, previous research indicates being (or becoming) physically active may confer numerous health benefits for older adults (e.g., Callow et al., 2020; Lyons et al., 2014; Reid & Foster, 2017; etc.). Second, previous research indicates that physical activity participation levels-either in terms of starting or maintaining engagement-are sub-optimal for older adults, including those living in Canada (e.g., Beauchamp et al., 2018; etc.). While the underlying cause of this ‘paradox’ is unknown (and beyond the scope of this study), it highlights the potential role of exercise professionals² (e.g., registered kinesiologists, etc.) in reducing physical inactivity rates displayed by older adults living in Canada. Assuming exercise professionals play a central role in helping older adults in Canada engage in regular physical activity behaviour, it raises this question: Do exercise professionals obtain training in post-secondary degree programs specific to physical activity with a focus on older adults?

Post-Secondary Degrees in Kinesiology: What Do We Know?

Physical activity is a key component of post-secondary degree programs focused on kinesiology (Johnson & Twietmeyer, 2018). According to the College of Kinesiologists of Ontario (CKO)-the regulatory body governing accreditation plus scope of practice for registered kinesiologists in Ontario (Canada)-kinesiology is the empirical study of human movement, functionality, and performance (CKO, n.d.a). The CKO was founded after the Kinesiology Act was introduced to Ontario law in 2007 (CKO, n.d.a) with the purpose of regulating the profession of kinesiology in accordance with public interest (CKO, n.d.a). Membership in the CKO is mandatory for practicing kinesiologists in Ontario, Canada (CKO, n.d.b). Overall, the CKO provides oversight regarding at least two issues linked with educational training of members: (1) Entrance requirements to become a registered kinesiologist (CKO, n.d.c); (2) Continuing education requirements for members to maintain accreditation as a kinesiologist (CKO, n.d.a).

According to the CKO (n.d.c), any person wishing to work as a kinesiologist in Ontario (Canada) must be registered with the college and pass the entry-to-practice exam. Initiating the application process to write the entry-to-practice exam with the CKO requires applicants to satisfy any of these educational requirements: (a) 4-year bachelor's degree in kinesiology; (b) 4-year bachelor's degree in a subject deemed similar to kinesiology (e.g., physical education, etc.); (c) Bachelor's degree in kinesiology (≤ 3 years of study) or similar field (≥ 4 years of study) from another Canadian province; or (d) International education. Combined with Johnson and Twietmeyer's (2018) work arguing for the importance of physical activity as a core component of undergraduate kinesiology programs, it may be reasonable to infer from the CKO's educational

requirements that post-secondary qualifications (i.e., a university degree, etc.) is mandated by the CKO to write the entry-to-practice exam. This prompts another question: What is currently known about post-secondary degree training programs focused on kinesiology offered within Ontario, Canada?

Few studies to date have examined the scope of training provided to kinesiology students in post-secondary degree programs designed and delivered by universities in Ontario, Canada. In a 2019 study, Wilson et al. reported findings of a curricular scan focused on the 2018-2019 undergraduate calendars published by Ontario universities with a kinesiology department (or equivalent; e.g., Human Kinetics). Wilson et al. (2019) reported that only 41.2% of universities with a kinesiology program in Ontario (Canada) taught course(s) focused on physical activity counselling. Elective courses designated by the CKO were readily available (85.3%) except for Introduction to Kinesiology (23.5%) that was offered by fewer universities with a kinesiology program in Ontario, Canada (Wilson et al., 2019). Perhaps the key finding emerging from the study by Wilson et al. (2019) was that kinesiology students may not receive training in a key skill-namely, physical activity counselling-as part of their undergraduate education in kinesiology programs across Ontario, Canada.

Wilson et al. (2019) argued that occupational demands for exercise professionals working to change physical inactivity behaviour-which included physical activity counselling-seemed mismatched with course offerings in kinesiology programs within Ontario, Canada. Additional research focused on physical activity training obtained by physicians from medical schools adds support for the work reported by Wilson et al. (2019). For example, Weiler et al. (2012) published research indicating 1 in 4 people

living in England would be physically active if advised yet 54% stated that a physician never offered any such recommendations. Further inspection of 31 medical schools in the United Kingdom (UK) by Weiler et al. (2012) revealed that 5 schools had no physical activity training for medical students at all with only 56% of all medical schools in the UK indicating they provided instruction specific to the chief medical officer's guidelines for physical activity. Overall, these studies make it clear that curricular offerings in university programs devoted to physical activity for trainee health-care professionals was infrequent at best with important content (e.g., physical activity counseling, etc.) needed by exercise professionals³ noticeably absent.

Justification for Study

Building on previous research (e.g., Weiler et al., 2012; Wilson et al., 2019), there may be a need to further evaluate post-secondary educational opportunities for kinesiology students to determine if coursework on physical activity and older adults populates the curriculum. The justification for this study was twofold. First, few studies have evaluated post-secondary education curriculum devoted to physical activity for health-care professionals (e.g., Weiler et al., 2012, etc.), and/or content available for kinesiology students (e.g., Wilson et al., 2019). Combining increased life expectancy (e.g., Canada Protection Plan, 2020, etc.) with greater risk of acute/chronic disease that accompanies older age (e.g., Lyons et al., 2014, etc.), it is likely that exercise professionals will serve older adults as clients in their day-to-day work. At present, it remains unclear if kinesiology programs offer courses focused on physical activity for older adults that might be 'necessary' to future exercise professionals working with this subset of the population.

Second, replication is uncommon despite the importance of repeating investigations to determine the generalizability of previous results (e.g., different participants, etc.; Schmidt, 2009). Schmidt (2009) proposed two different approaches to replication labelled (1) direct and (2) conceptual. Direct replication uses previous research to replicate (exactly) the methodological approach to investigate the phenomena whereas conceptual replication is guided by previous research yet relies on different methods to investigate the phenomena (Schmidt, 2009). Presently, the study by Wilson et al. (2019) maybe the only investigation focused on evaluating curriculum taught in undergraduate kinesiology programs at post-secondary institutions, yet the study was exclusively focused on physical activity counseling. Building on the arguments set forth by Schmidt (2009), this study was designed based on direct replication of Wilson et al. (2019) with extension to a different content area within the curricular offered by undergraduate degree programs for kinesiology, namely older adults and physical activity. Stated differently, this study used the same methodological approach reported by Wilson et al. (2019) combined with a different area of focus within the undergraduate programs of kinesiology departments across Ontario, Canada.

Study Purpose, Research Questions, and Study Hypothesis

The overall purpose of this study was to evaluate kinesiology curriculum offered by universities within Ontario (Canada) for courses taught with an emphasis given to older adults and physical activity. This study's purpose is best classified as 'exploratory' research (Stebbins, 2001). 'Exploratory research' can be conducted when limited knowledge specific to one area of study exists but justification for additional investigation of the area is warranted (Stebbins, 2001; Swedberg, 2020). Justification for

this study was predicated on at least two assumptions. First, students graduating from kinesiology programs may be considered physical activity ‘experts’ yet shortcomings in education have been demonstrated in previous research albeit in other content domains (e.g., physical activity counselling; Wilson et al., 2019). Second, it remains unclear if kinesiology students are ‘prepared’ to work with older adults in physical activity settings based on training obtained as a function of their post-secondary education.

To address the study purpose, the following research question was investigated: What percentage of courses offered in kinesiology programs at universities in Ontario (Canada) focus on older adults and physical activity? Kline (2009) distinguished between various types of research questions: (1) Descriptive, (2) Relational, and (3) Causal. The research question pursued in this study was descriptive according to Kline’s (2009) taxonomy given that no testing for the direction/magnitude of associations between variables (i.e., relational question) or identification of underlying processes or mechanisms (i.e., causal questions) was sought. Extrapolating from Kline (2009) and Stebbins (2001), no a priori hypotheses were developed or advanced for this study.

Methods

Study Design

This study used a non-experimental research design paired with archival data. Vogt et al. (2012) contend that pre-existing (or ‘archival’) data can be used in lieu of primary data collection assuming the research question can be answered by doing so thus avoiding (a) incurring unnecessary research expenses, and (b) wasting available data. The archival data were extracted from undergraduate calendars published by kinesiology departments (or equivalent; e.g., Human Kinetics, etc.) for eligible universities in Ontario (Canada)

during the 2021-2022 academic year. Each undergraduate calendar was publicly accessible during the data extraction phase of this study.

Data Source

Following Wilson et al. (2019), the sampling frame contained all post-secondary institutions classified as ‘universities’ in 2021 within the province of Ontario (Canada). Data was collected from the undergraduate calendar of each university that consisted of a kinesiology department (or equivalent) to examine (a) course titles and (b) course descriptions for evidence of focus on physical activity and older adults within the course. An undergraduate calendar in Canada is the official document that catalogues all degree requirements for students to complete prior to graduation plus describes the focal content (or emphasis) per course within the calendar (Wilson et al., 2019).

The inclusion criteria guiding the sampling process for this study were as follows: (1) Undergraduate calendar written in English, (2) located geographically in the province of Ontario (Canada), (3) classified as a university by the Government of Ontario (Canada; e.g., Brock University, McMaster University, etc.), and (4) university included a kinesiology department (or equivalent; e.g., Human Kinetics; etc.). The exclusion criteria guiding the sampling process for this study were as follows: (1) Undergraduate calendar written in any language other than English (e.g., French, etc.), (2) not located geographically in the province of Ontario (Canada), (3) not classified as a university by the Government of Ontario (Canada; e.g., Niagara College, Mohawk College, etc.), and (4) university did not include a kinesiology department (or equivalent; e.g., Human Kinetics; etc.).

Instrumentation

A coding manual was used to guide data extraction from the sample in this study. The coding manual was developed using best-practice guidelines for knowledge synthesis research advanced initially by Cooper (1982). The first iteration of the coding manual for this study was created by the principal student investigator-Cassidy L. Edlington (CLE)-based on modifications to the instrument used by Wilson et al. (2019). A second draft of the coding manual included edits provided by Philip M. Wilson (PhD) while a third draft of the coding manual included edits provided by Diane E. Mack (PhD). There were five sections in the coding manual labelled as the follows: (1) Institutional Filters, (2) Institutional Background, (3) Degree Offerings, (4) Courses on Older Adults (OA) and Physical Activity (PA), and (5) CKO Courses/Content. The coding manual is provided in Appendix A.

CLE was responsible for coding the data used in this study. A brief synopsis of the principal student investigator's educational qualifications, extra-curricular training, and occupational/volunteer experiences is provided here for transparency. At present, CLE is completing a 24-month graduate degree culminating in a Master of Science (Kinesiology) supervised by Dr. Philip M. Wilson (Professor, Department of Kinesiology, Brock University). CLE graduated from Brock University in 2020 earning a Bachelor of Kinesiology degree (4-year). Within her undergraduate studies, CLE received formal training via courses focused exclusively on physical activity and older adults. For example, CLE completed KINE4P12 ('Exercise Programming for Older Adults'; Undergraduate Calendar, Brock University, n.d.) from May to August (2019). This course included a supervised 60-hour field placement (6 hours/week; 10 weeks total) in 'SeniorFit' – a community outreach program offered by the Brock-Niagara Centre for

Health and Well-Being that delivers physical activity programs to eligible older adults (persons aged ≥ 55 years living with/at risk for non-communicable diseases; e.g., cardiovascular disease, etc.) using a fee-for-service model.

CLE has acquired extra-curricular qualifications in these areas: (a) Motivational interviewing in brief consultations (Fall, 2019); (b) Research ethics (Tri-Council Policy Statement: Course on Research Ethics [C.O.R.E.]; September 15th, 2020).

Complimenting her formal educational and extra-curricular qualifications, CLE has accumulated work-related and volunteer experiences linked to service provision for community-dwelling older adults. First, CLE volunteered with the Alzheimer's Society (Niagara Region) in the 'Recollection Program' from May to August (2019). The goal of this 8-week program was to create a book about the client's life based on select topics. CLE conducted individual meetings lasting ~60 minutes/session with older adults enrolled in the 'Recollection Program'. Second, CLE has worked in Long-Term Care (LTC) facilities (Sarnia, Ontario) as a Life Enrichment Aid (LEA) from April to August (2020). LEA's work alongside health-care professionals to maximize quality of life care for older adults living in LTC. In her LEA duties, CLE assisted with the delivery of exercise programs supervised by a Physiotherapy Assistant to residents of the LTC twice per week.

Data Extraction

Before data were collected for this study, the Research Ethics Board (REB) at Brock University reviewed the study (File #21-132-WILSON) and deemed it 'exempt' as no human participants were involved (TCPS-2, 2021; Article 2.1), and the data collected

for this study relied upon publicly available information (TCPS-2, 2021; Article 2.2). The letter of exemption from the REB at Brock University is provided in Appendix D.

A synopsis of the data extraction process for this study is provided here for transparency. The data extraction process was developed for this study by consulting the following sources: (a) Preferred Reporting Items for Systematic Reviews and Meta-Analyses [PRISMA] guidelines (see Page et al., 2021, for details), and (b) modifications to study protocols reported by Wilson et al. (2019). Based on the PRISMA guidelines, the following 3-step process was used to guide data extraction: (a) Identification, (b) Screening and Eligibility, (c) Included. In the stage labelled '*identification*', records were sought from the official website hosted by the Government of Ontario (<https://www.ontario.ca/page/government-ontario>) focused on education and training in the public university system within the province (see this link for details: <https://www.ontario.ca/page/ontario-universities>) and private post-secondary institutions (see this link for details: <https://www.ontario.ca/page/private-postsecondary-schools>). Weblinks to each post-secondary institution were listed alongside institutional names to collect further information. In the stage labelled '*screening and eligibility*', all universities emerging from the identification stage were scrutinized using the inclusion/exclusion criteria for this study. '*Screening*' identified the universities that contained a Department of Kinesiology (or equivalent) and excluded those that did not. The universities were assessed in '*eligibility*' for English-language and publicly accessible undergraduate calendars. The universities with undergraduate calendars published in any language other than English (e.g., French, etc.) and/or had private undergraduate calendars were excluded in this stage. The final stage-labelled '*included*'-

provided a synopsis of the sample used in this study. The PRIMSA flowchart showcasing this process for this study is presented in Appendix B.

Two approaches to searching each undergraduate calendar were used in this study. First, an electronic-based keyword search was conducted per undergraduate calendar using the following terms: ‘Physical Activity’; ‘Exercise’; ‘Movement’; ‘Sports’; ‘Conditioning’; ‘Fitness’; ‘Geriatrics’; ‘Seniors’; ‘Elderly’; ‘Aged’. These terms were obtained directly (or modified in part) from the National Library of Medicine (Medical Subject Headings; MeSH). This study also included the following search term which was not listed with MeSH: ‘Older Adults’. Any undergraduate course with one (or more) of these search terms in the course title and/or course description were reviewed for this study. Second, a manual search of the entire undergraduate calendar published in the 2021-2022 academic year per university in Ontario (Canada) was undertaken to ensure no omissions resulted from exclusive use of the electronic-based keyword search procedure in this study.

Using either approach to searching the undergraduate calendars, a university-based course in a kinesiology department (or equivalent) was classified as focused on older adults and physical activity when the following conditions were met: (1) Course title/course description indicated older adults serve exclusively as the area of interest within the population, and (2) course title/course description indicated exclusive focus on any type of physical activity (e.g., exercise, sport, etc.). Appendix C provides an example for illustrative purposes.

Data Analyses

Data analyses relied on descriptive statistics for this study. Frequency counts were used (where indicated) to measure the number of occasions that signified an event had occurred within the data set (Blaikie, 2011; O'Dwyer & Bernauer, 2014). Frequency distributions were converted to proportions and percentages (where indicated) for this study (Blaikie, 2011). Proportions were calculated by taking the frequency of each category and dividing it by the frequency total for the value to get a decimal number whereas percentages were then calculated by multiplying the proportion number by 100 (Blaikie, 2011).

Measures of central tendency were used (where indicated) to describe the typical score (i.e., mean, median, or mode) for items coded in this study (O'Dwyer & Bernauer, 2014; Blaikie, 2011). The mean is defined as the sum of the combined values divided by the total number of values (Blaikie, 2011). The mode assessed the highest observed frequency within a distribution of scores that occurred within the data from this sample (Blaikie, 2011). The median was the point estimate separating the highest from the lowest half of scores in a distribution of scores provided by a sample (Blaikie, 2011). The specific measure of central tendency varied depending on the level of measurement used to assess coded items in this study.

Measures of dispersion were calculated (where indicated) and reported in conjunction with measures of central tendency to determine variability across scores reported in the distribution (Blaikie, 2011; O'Dwyer & Bernauer, 2014). In this study, the measures of dispersion-range/interquartile range, variance, and/or standard deviation (O'Dwyer & Bernauer, 2014)-were calculated (where indicated) for relevant coded items. The range was calculated as the difference between the lowest and the highest value

while the interquartile range took numbers from the middle of the distribution extracting 25% of the high and low values to eliminate scores at the extremes of the distribution (Blaikie, 2011). The variance gave an average value of how much a score deviated from the mean (O'Dwyer & Bernauer, 2014). The standard deviation is the square root of the variance which estimates the spread of numbers from the mean in the original units for each measured variable (O'Dwyer & Bernauer, 2014).

Each university was assigned one unique identification number (i.e., 1,...,16) prior to data extraction to randomize order. These sixteen unique identification numbers were entered into a web-based program for subsequent randomization (see link for details: <https://www.randomizer.org/>). Order randomization prior to data extraction was used to reduce potential order effects that may bias the data (Malhotra, 2008; Perreault, 1975). The numbers assigned per university for randomization were as follows: (1) Brock University, (2) Lakehead University, (3) Laurentian University, (4) McMaster University (5) Nipissing University, (6) Ontario Tech University, (7) Queen's University, (8) University of Guelph, (9) University of Ottawa, (10) University of Toronto, (11) University of Waterloo, (12) University of Windsor, (13) Western University, (14) Wilfrid Laurier University, (15) York University, (16) Redeemer University. The results of the randomization process providing the order in which each undergraduate calendar was examined in this study was as follows in this study: 6, 9, 8, 13, 4, 2, 15, 12, 7, 14, 10, 16, 11, 3, 1, 5.

The total number of courses offered per kinesiology department (or equivalent; e.g., Human Kinetics, etc.) presented in randomized order for this study was as follows: (1) Ontario Tech University - 48, (2) University of Ottawa - 77, (3) University of Guelph -

25, (4) Western University - 98, (5) McMaster University - 44, (6) Lakehead University - 48, (7) York University - 93, (8) University of Windsor - 93, (9) Queen's University - 54, (10) Wilfred Laurier University - 60, (11) University of Toronto - 91, (12) Redeemer University - 37, (13) University of Waterloo - 65, (14) Laurentian University - 98, (15) Brock University - 89, (16) Nipissing University - 89. Figure 3 displays the total number of courses offered in each department per university.

The principal student investigator (CLE) created a master file using Microsoft Excel that included the following data for every course listed by the kinesiology department (or equivalent) in the undergraduate calendar per university prior to coding: (1) Course codes, (2) course titles, and (3) course descriptions. Any course listed as a degree requirement for kinesiology students taught in a different academic department (e.g., biology, physics, etc.) were not included in this list.

Results

Preliminary Analyses: Identification

In 2021, twenty-three public universities and seventeen private post-secondary institutions were listed by the Government of Ontario, Canada. There were no duplicate records between (a) public versus private institutions or (b) institutions listed multiple times under either public or private categories that warranted removal before screening. Eleven post-secondary institutions (private) were removed before the screening and eligibility phase of this study because they were classified as 'colleges' (not universities) based on a review of the institutional name (e.g., Emmanuel Bible College, etc.). The Royal Military College was retained at this stage of the study because in this post-

secondary institution was classified as a ‘university’ by the Government of Ontario, Canada.

Preliminary Analyses: Screening and Identification

Twenty-nine universities (23 ‘public’; 6 ‘private’) were screened to determine if the institution had a kinesiology department (or equivalent). Fifteen public universities contained a kinesiology department (or equivalent). The only private university that contained a kinesiology department (or equivalent) was Redeemer University (see Table 1 for details). Ten universities were excluded from consideration at this stage of screening because they did not have a kinesiology department (or equivalent). Trent University was removed at this stage of the process because it offered a Bachelor of Science degree in Kinesiology without a kinesiology department (or equivalent) listed at the institution. Ontario Tech University was retained at this stage of the screening process because it had a Faculty of Health Sciences which the principal student investigator (CLE) deemed equivalent to a Department of Kinesiology (as outlined in the coding manual for this study; See Appendix A for details).

Nineteen universities were assessed for ‘eligibility’. Three universities were excluded at this stage of the process for the following reasons: (1) no website or public access to an undergraduate calendar (i.e., Maimonides Schools for Jewish Studies); and (2) presentation of the undergraduate calendars in French only (i.e., Université de l’Ontario français; University of Hearst). This resulted in a total of 16 universities (15 ‘public’; 1 ‘private’) included for the sample in this study. Table 1 summarizes this process for each university listed in the sampling frame.

Preliminary Analyses: Institutional-Level and Departmental-Level Variables

Table 3 displays the values for demographic variables across each of the 16 universities comprising the sample for this study. The median institution age based on year founded per university was 64.0 years ($M_{age} = 97.3$ years; $SD_{age} = 59.4$ years; $Range = 19.0$ to 195.0 years).⁴ Fifteen institutions (40.0%) were categorized by Maclean's rankings (see Dwyer, 2021, for details) as 'comprehensive', followed by 'medical/doctorate' (33.3%), then 'primarily undergraduate' (26.7%). One institution-Redeemer University-was omitted from the Maclean's rankings because enrollment at the university did not exceed one thousand students in total (Dwyer, 2021). Median part-time/full-time undergraduate student enrollment was 21,626.50 students across institutions ($M = 23,986.38$ students; $SD = 18,676.13$ students; $Range = 896$ to $72,785$ students).

Interinstitutional variability in departmental names (see Figure 1) was evident with Department of Kinesiology (26.7% of the sample) the most frequently used name.⁵ Median size per department was 22.0 faculty ($M = 22.87$ faculty; $SD = 11.10$ faculty; $Range = 3.0$ to 48.0 faculty).⁶ Faculty reporting physical activity and older adults as their research interest or area of expertise ranged from 0.0 to 7.0 faculty members ($Md = 1.0$ faculty member; $M = 1.93$ faculty members; $SD = 1.83$ faculty members).⁷ Most institutions offered a Bachelor of Science (56.3%) degree with Bachelor of Arts (31.3%) followed by Bachelor of Kinesiology (25.0%) the next most popular degree options provided by this sample of universities in Ontario, Canada (see Figure 2 for details). The median number of total undergraduate courses offered within kinesiology departments (or equivalent) was 71.0 courses ($M = 69.3$ courses; $SD = 24.5$ courses; $Range = 25.0$ to 98.0 courses).

Main Analyses: Older Adults and Physical Activity Courses

Figure 4 displays the number of courses focused on older adults and physical activity offered per university via kinesiology departments (or equivalent) in Ontario, Canada. Most institutions ($n = 13$; 81.3%) offered courses devoted to older adults and physical activity with few universities ($n = 3$; 18.7%) listing no undergraduate courses targeting physical activity and older adults. The median number of undergraduate courses focused on physical activity and older adults offered per kinesiology department (or equivalent) for all 16 universities providing data for this study was 1.0 course ($M = 1.5$ courses; $SD = 1.2$ courses; $Range = 0.0$ to 4.0 courses). This represented between 0.0% to 6.15% of the total number of undergraduate courses offered per kinesiology department (or equivalent) across the sample providing data for this study.

Two universities-Western University (KINE 4412A/B: Exercise for specific populations: Impairment and aging) and Brock University (KINE3P97: Exercise physiology in aging and disease)-offered courses ($n = 1$ per university) with more specialized (or targeted) focus on physical activity and older adults. Inspection of course descriptions for each undergraduate courses indicated the course focused on managing chronic diseases in older adults using exercise as the physical activity modality.

Table 4 (required CKO courses) and Table 5 (elective CKO courses) presents the coded data for courses listed as prerequisites for the licensing exam by the CKO. Human Biomechanics and Psychomotor Learning/Neuroscience (100%) were the most common required undergraduate courses listed within this sample while Pathology (6.3%) was the least common required course (see Table 4 for details). In terms of elective undergraduate courses, Other Kinesiology-Related Electives was the most common undergraduate

course (100.0%) while Introduction to Kinesiology (37.5%) was the least common elective (see Table 5 for details).

Discussion

Life expectancy has increased over the last century for older adults in Canada raising concerns with declining mental and/or physical health displayed by this cohort (Lyons et al., 2014). Previous studies indicate regular physical activity may improve health and extend life in older adults which implies this cohort may benefit from the expertise of qualified personnel-‘exercise professionals’-that specialise in physical activity (Lyons et al., 2014; Callow et al., 2020; Reid & Foster., 2017). University programs in kinesiology are one academic training ground for exercise professionals with curriculum devoted to studying physical activity (Johnson & Twietmeyer, 2018). To date, no studies have evaluated the availability of courses dedicated to older adults and physical activity offered by kinesiology departments at the post-secondary level in Ontario, Canada. The research question guiding this study was as follows: What percentage of courses offered in kinesiology programs at universities in Ontario (Canada) focus on older adults and physical activity?

This study used a non-experimental research design paired with archival data (Vogt et al., 2012) to address the research question. Using PRISMA guidelines (see Appendix B), a sample ($n = 16$) was drawn from a sampling frame ($N = 29$) comprised of public and private universities with a kinesiology department (or equivalent) located in Ontario, Canada. Keyword searches of undergraduate calendars published for the 2021-2022 academic year were scrutinized for course title(s)/course description(s) focused on physical activity and older adults. Overall, 16 (15 ‘public’; 1 ‘private’) universities

reported a kinesiology department (or equivalent) in the 2021-2022 academic year and most of these post-secondary institutions (81.3%) listed at least one undergraduate course focused on physical activity and older adults. Only 3 of 16 (18.7%) universities in this study did not include any undergraduate courses devoted to older adults and physical activity in the 2021-2022 academic year.

Why are University-Level Courses on Physical Activity and Older Adults Included Within Kinesiology Curriculum in Ontario, Canada?

Several reasons were advanced to explain the main finding emerging from this study. These reasons were speculative in nature yet warrant consideration alongside the results of this study in conjunction with previous studies of curriculum targeting physical activity ‘content’ broadly defined (Weiler et al., 2012; Wilson et al., 2019). A summary of these reasons is presented here: (a) Gerontology was listed as elective coursework by the College of Kinesiologists of Ontario; (b) Faculty expertise determines curriculum focus in kinesiology at the post-secondary level; or (c) Previous research focused on different academic content (or issues) compared to this study. Additional commentary for each plausible explanation is provided next for consideration.

Perhaps the most likely explanation for the results of this study was the CKO listed coursework focused on physical activity and older adults in elective components of educational training for people seeking admission to the college. As noted in Table 5, the CKO listed the study of physical activity specific to older adults-phrased as follows: ‘Gerontology/Physical Activity/Aging’-as one of ten elective content areas in which applicants can take coursework. Additional details provided by the CKO in 2019 implied that courses offered in this area focused on stimulus-responses principles whereby

physical activity (i.e., stimulus) elicits observable changes (i.e., response(s)) across multiple domains (e.g., physical, psychological, sociological, etc.) in older adults. In Ontario (Canada), the CKO is the regulatory body overseeing the practice of registered kinesiologists to maintain professional standards and safeguard public interests. As such, it seems likely that areas designated as important by the CKO for educational training- such as the study of older adults and physical activity- would be one important factor guiding curricular offerings for undergraduate kinesiology students across universities provincially given that becoming an RKIN is a plausible career option for graduates of these programs.

One alternative explanation for the results of this study concerns the faculty responsible for teaching undergraduate courses in kinesiology at universities located across Ontario, Canada. Inspection of the 16 universities comprising the sample used in this study indicated that only 6.7% ($n = 1$) of the sample did not have a faculty member with expertise in older adults and physical activity listed in 2021-2022 while 33.3% ($n = 5$) had two or more faculty reporting expertise in this area relative to research interests. Assuming that curriculum development is driven by faculty expertise combined with the findings of this study indicating 93.3% ($n = 14$) of the sample had at least one faculty member with expertise in physical activity and older adults then it follows that courses in this elective area should be available to undergraduate kinesiology students within Ontario, Canada.

A final potential explanation for the main findings emerging from this study is advanced with a focus on the published research that provided the background for the current study. While there has been limited focus on curriculum issues targeting

kinesiology at the post-secondary level published in the literature (e.g., Wilson et al., 2019, etc.), this study extended previous research on physical activity training for medical students (Weiler et al., 2012) and undergraduate students in kinesiology (Wilson et al., 2019). Yet it remains plausible that comparing the results of this study with those published by Weiler et al. (2012) and Wilson et al. (2019) may be analogous to skeptical practices described by Blackstone (2002) of contrasting “apples and oranges” (p. 8) instead of comparing “apples-to-apples” (p. 9). Neither Weiler et al. (2012) nor Wilson et al. (2019) evaluated courses offered within kinesiology curriculum relative to older adults and physical activity suggesting the literature informing this study may be criticized on content matter focus. Extrapolating from Blackstone’s (2002) work to the current study, it may be that differences in prevalence rates for course listings is a function of comparing ‘apples’ (i.e., courses on physical activity and older adults) to ‘oranges’ (e.g., physical activity training in medical school; Weiler et al., 2012).

Auxiliary Findings: What Else Does This Study Tell Us About Kinesiology

Curriculum in Ontario, Canada?

At least two additional observations emerged from this study beyond the main findings that seem worth highlighting. First, it is clear from this study that courses devoted to physical activity and older adults varied in prevalence across universities located in Ontario, Canada. In the universities ($n = 13$) offering an undergraduate course focused on older adults and physical activity, six institutions listed between two and four courses, yet seven institutions listed one course only in this area. This finding raises at least two questions worthy of further inquiry. First, why does variability in the number of courses devoted to older adults and physical activity exist in kinesiology departments (or

equivalent) within the same province? Second, what is the optimal number of courses required of kinesiology students devoted to physical activity and older adults to guarantee sufficient knowledge in this area to guide exercise professionals in clinical practice? Both questions relate to a broader issue that is perhaps best captured by this question: What is the optimal content for curriculum taught within kinesiology departments (or equivalent) at the post-secondary level to ensure that graduates have sufficient expertise to practice competently as an exercise professional?

A second ancillary finding emerging from this study concerned the portion of undergraduate courses devoted to older adults and physical activity relative to all courses taught within kinesiology departments (or equivalent) at universities in Ontario, Canada. In this sample ($n = 16$), the median number of undergraduate courses taught within kinesiology departments (or equivalent) was 71.0 courses in 2021-2022 ($Range = 25.0$ to 98.0 undergraduate courses). Further inspection of the data indicated courses devoted to older adults and physical activity in 13 of the 16 universities comprising this sample accounted for between $\sim 1.02\%$ and $\sim 6.15\%$ of the available courses within the kinesiology department (or equivalent) in the 2021-2022 academic year. The percentage (i.e., $\sim 1.02\%$ and $\sim 6.15\%$) is based on the number of courses being offered within the Department of Kinesiology (or equivalent) of each university that contained at least one course on older adults and physical activity as the lowest number being offered was one and the highest was four. In terms of absolute value, this was a small percentage of total courses listed for students enrolled in undergraduate kinesiology programs across Ontario, Canada. This finding raised another question for consideration: If kinesiology departments (or equivalents) are the main academic discipline training future exercise

professionals, what portion of their academic program should be devoted to subspecialisation(s) (e.g., older adults and physical activity)?

Practical Implications: What Can We Do?

Two implications may be advanced from this study based on the major findings. In brief, these implications were summarised as follows: (a) Informing content (current/future) of existing undergraduate curriculum in kinesiology taught across Ontario (Canada), and (b) justification for extra-curricular training opportunities to prepare kinesiology graduates for a career as an exercise professional. Each of these implications is presented then discussed briefly in this section.

One implication from this study is that wholesale changes to ‘current’ undergraduate curriculum in kinesiology departments (or equivalent) across Ontario (Canada) seems unjustified relative to offering courses focused on physical activity and older adults. Given that over eighty percent of the universities with a kinesiology department (or equivalent) in Ontario (Canada) offered courses focused on physical activity and older adults it seems this ‘elective’ area of the CKO was available to undergraduate students. By contrast, previous studies in medicine (Weiler et al., 2012) and kinesiology (Wilson et al., 2019) have identified gaps in content (e.g., physical activity counseling, etc.) within undergraduate curricula leading to calls for updates to post-secondary education in key domains linked with clinical practice. Based on this study, most universities in Ontario (Canada) offered formal courses devoted to older adults and physical activity that may be useful for kinesiology students planning to become an exercise professional. These data, while not without limitations, suggest

widespread reform of curriculum offered at most universities in Ontario (Canada) seems unwarranted at present.

How do these findings inform potential ‘future’ curriculum development for kinesiology students at post-secondary institutions across Ontario, Canada? First, not every university with a kinesiology department (or equivalent) in this study offered a course devoted to older adults and physical activity. Specifically, 18.7% of the sample in this study included no classes within this elective area defined by the CKO. This implied training opportunities in formal courses across post-secondary education institutions focused on kinesiology in Ontario (Canada) may not have provided unbiased access for students to all elective areas recognised by the CKO. The net effect of this ‘restricted’ access to formal training via university courses as a function of institutional preferences on professional competencies exhibited by future exercise professionals remains unclear yet worthy of investigation. Second, not every university offered the same number of courses devoted to older adults and physical activity to kinesiology students. This finding calls into question the ‘optimal’ number of training opportunities needed for kinesiology students to practice as exercise professionals if working with older adults.

Another implication emerging from this study concerns the justifiability of ‘extra-curricular’ training opportunities designed to prepare trainees for work as exercise professionals. Formal training necessary to become an exercise professional (e.g., personal trainer, etc.) is not ‘restricted’ exclusively to courses within degree granting programs taught via universities in Ontario, Canada. For example, the Canadian Centre for Activity and Aging (see this link: <https://www.uwo.ca/ccaa/education/index.html>) offers up to four evidence-based training modules (e.g., Senior Fitness Instructor

Certification, etc.) designed to educate current/future exercise professionals in physical activity for older adults. Each module represented a ‘training opportunity’ that kinesiology students could access to expand their professional development skills relative to physical activity and older adults. Yet the results of this study imply that opportunities exist in kinesiology departments for students to obtain training about physical activity and older adults via formal courses offered within most universities across Ontario, Canada. As such, one implication of this study may be that further development of ‘siloes’ training modules devoted to older adults and physical activity distinct from university-based courses may be unnecessary at least for students in Ontario, Canada.

Limitations and Future Directions

There were several limitations in this study that warrant consideration alongside the main findings to guide interpretation. The limitations of this study included the following: (a) Use of a non-experimental research design to investigate a descriptive question (Kline, 2009), (b) limited generalizability of the research findings given the nature of the sampling frame and sample used in this study, and (c) exclusive use of archival data. Each limitation is presented below accompanied by future directions that could be used to advance research in this area.

One limitation of this study was reliance on a non-experimental design which lacks random assignment of participants to groups and/or manipulation of independent variable(s) (Trochim, 2022). Omitting these design features exposes non-experimental designs to various internal validity threats which in turn provide limited evidence for establishing causation in research (Trochim, 2022). Non-experimental designs are useful for research focused on ‘description’ which served as the main aim of this study. Future

studies may wish to address this issue by using alternative research designs (e.g., mixed-methods design, etc.) possibly with different research questions (e.g., Is the number of courses taken focused on older adults and physical activity linked with post-graduate employment of kinesiology students in gerontological care?) to provide greater insight regarding curricular design for undergraduate kinesiology programs across Ontario, Canada.

Another limitation of this study concerned the nature of the sampling frame used to guide the identification and selection of the sample. Representation of the population is an important feature of sampling that impacts external validity of results from research (Zhang et al., 2013). External validity may be questioned in studies that employed restrictive inclusion/exclusion criteria (Zhang et al., 2013) like the current study. The sampling frame ($N = 29$) was restricted only to universities located in Ontario, Canada. The sampling frame was obtained from an official website published by the Government of Ontario in 2021 (see methods for specific weblink). Consequently, the sample was limited to a subset of universities located only within Ontario (Canada) which likely did not represent (a) post-secondary institutions not designated as universities (e.g., colleges, etc.), (b) non-educational organisations (e.g., American College of Sports Medicine, etc.), and/or (c) post-secondary institutions designated as universities located in other provinces (e.g., Alberta, etc.) or territories (e.g., North West Territories, etc.) representing Canada. Future work in this area could address this issue by expanding the initial sampling frame to include representation at least across the following strata: (a) geographical location in Canada (e.g., Manitoba, etc.), and (b) organisational type providing training focused on older adults and physical activity for exercise professionals (e.g., CSEP, etc.).

One further limitation of this study was the exclusive reliance on archival data which presents numerous issues for researchers. Vogt et al. (2012) and Gilliland et al. (2017) both contend that archival data can be problematic because the raw data itself was not collected initially for research perhaps making it difficult to locate and/or extract the requisite data for any study from the archived source (e.g., undergraduate calendars, etc.). In this study, the construction and/or presentation of each undergraduate calendar was not standardized across universities thus increasing the difficulty of locating (and/or interpreting) then extracting the data from these archived repositories. In this study, it is plausible that raw data was overlooked within each archived source that may have been useful to address this study's purpose. Future research could address this limitation by using alternative (or complimentary) sources of data to mitigate the problems inherent with reliance on archival sources. One possibility is to follow the approach taken by Weiler et al. (2012) which used a non-experimental (cross-sectional) research design with data provided via responses to questionnaires from university faculty concerning the content of courses offered by medical schools.

Conclusions

The purpose of this study was to evaluate kinesiology curricular taught at the university-level in Ontario (Canada) for courses emphasizing content on physical activity and older adults. This research was guided by the following question: What percentage of courses offered in kinesiology programs at universities in Ontario (Canada) focus on older adults and physical activity? Using a non-experimental research design paired with archival data, the main finding emerging from this study was 81.3% of the sample ($n = 16$ universities) listed an undergraduate course devoted to physical activity and older adults

in 2021-2022. Possible reasons accounting for this main finding were advanced which included the impact of CKO elective coursework on university curricular, faculty expertise as a key determinant of university course foci, and departure from previous literature in terms of the focus of this study. Overall, it would appear reasonable to suggest that kinesiology students pursuing undergraduate degrees at most universities in Ontario (Canada) have access via formal courses devoted to older adults and physical activity. Based on this observation, it would seem prudent to determine the optimal number of courses needed in this content area in addition to the nature of the content required in these courses to maximize the training of future exercise professionals likely to aid older adults with the challenge of becoming and staying physically active.

Endnotes

¹ Health-care professionals have been defined by the World Health Organization (2013) as those with education in human health. Health-care professionals “study, diagnose, treat and prevent human illness, injury and other physical and mental impairment in accordance with the needs of the populations they serve” (p. 57). Examples of health-care professional listed from World Health Organization (2013) included medical doctors, nurses, midwives, dentists, and pharmacists.

² Warburton et al. (2009) defined qualified exercise professionals as “individuals with advanced education, certification, and practical training in exercise sciences” (p. 18). Warburton et al. (2009) highlighted certified personal trainers and exercise physiologists as examples of exercise professionals while reinforcing the value of post-secondary education for this work. A degree in kinesiology and/or the exercise sciences was discussed as the starting point for post-secondary education of exercise professionals (Warburton et al., 2009).

³ Warburton et al. (2009) stated that exercise professionals are one group of clinicians related to a broader health-care team. Exercise professionals have specific training in the kinesiology/exercise sciences and work in exercise settings which distinguishes them from other health-care professionals typically working in medical settings (e.g., nurses, physicians, dentists, etc.; World Health Organization, 2013) based on scope of practice and/or certification.

⁴ Institutional age was generated using data from two-step process. Step 1 used a web-based search with the following keyword terms to identify year founded: “University name + founded” (e.g., “York university + founded”, etc.). Step 2 verified the founding

year using either of the following: (a) A university-specific webpage detailing historical facts per institution, or (b) Data provided on the Maclean's website (see link for details: <https://www.macleans.ca/university-profiles/>).

⁵ No department name was found for Ontario Tech University therefore it was not included in the coding of this variable.

⁶ Ontario Tech University listed a faculty and not a department thus was not included in coding the following variables in this study: (a) Department faculty size; (b) Department faculty expertise.

⁷ Using the website links in Table 2, each faculty member's research interest(s) and/or expertise was screened for physical activity and older adults. A computer scan was conducted using "control + F" for key terms listed by the National Library of Medicine (Medical Subject Headings) plus "Older Adult" then the principal student investigator (CLE) read each faculty member's research interest(s) and/or expertise to eliminate potential omissions.

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<https://doi.org/10.1371/journal.pone.0082324>

Table 1

Summary of data analysis for variables coded as institutional filters

<i>Institution Name</i>	<i>Classification</i>	<i>Department</i>	<i>Calendar</i>	<i>Language</i>
Algoma University	☑	☒		
Brock University	☑	☑	☑	☑
Carleton University	☑	☒		
Lakehead University	☑	☑	☑	☑
Laurentian University	☑	☑	☑	☑
McMaster University	☑	☑	☑	☑
Nipissing University	☑	☑	☑	☑
OCAD University	☑	☒		
Ontario Tech University	☑	☑	☑	☑
Queen's University	☑	☑	☑	☑
Royal Military College	☑	☒		
Ryerson University	☑	☒		
Trent University	☑	☒		
University of Guelph	☑	☑	☑	☑
University of Hearst	☑	?	?	☒
Université de l'Ontario français	☑	?	?	☒
University of Ottawa	☑	☑	☑	☑
University of Toronto	☑	☑	☑	☑
University of Waterloo	☑	☑	☑	☑
University of Windsor	☑	☑	☑	☑
Western University	☑	☑	☑	☑
Wilfrid Laurier University	☑	☑	☑	☑
York University	☑	☑	☑	☑
Institute for Advanced Judaic Studies	☑	☒		
Institute for Christian Studies	☑	☒		
Maimonides Schools for Jewish Studies	☑	?	☒	
Redeemer University	☑	☑	☑	☑
St. Phillips Seminary	☑	☒		
Tyndale University	☑	☒		

Note. *Institution Name* = University Name. *Classification* = Designation of institution as a public or private university as per the Government of Ontario. *Department* = Institution had a Department of Kinesiology (or equivalent; e.g., Human Kinetics, etc.). *Calendar* = Public access to undergraduate calendar per institution. *Language* = Availability of undergraduate calendar in English language. ☑ = Met criteria. ☒ = Did not meet criteria. ? = unclear if criteria were met or not met. Blank spaces indicate a university was excluded at the previous stage of screening in this study. For example, Algoma University has blank spaces under the column headings *Calendar* and *Language* because this university did not meet the screening criteria for *Department* used in this study.

Table 2

Summary of websites for variables coded as institutional background

<i>Institution Name</i>	<i>Website Link</i>
Brock University	https://brocku.ca/applied-health-sciences/kinesiology/faculty-research/faculty-directory/
Lakehead University	https://www.lakeheadu.ca/programs/departments/kinesiology/faculty-staff
Laurentian University	https://laurentian.ca/faculty-directory
McMaster University	https://www.science.mcmaster.ca/kinesiology/people/faculty.html
Nipissing University	https://www.nipissingu.ca/academics/schulich-school-education/bachelor-physical-and-health-education
Ontario Tech University	
Queen's University	https://skhs.queensu.ca/people/faculty/
Redeemer University	https://www.redeemer.ca/academics/faculty/
University of Guelph	https://www.uoguelph.ca/hhns/graduate/faculty
University of Ottawa	https://uniweb.uottawa.ca/members?unit=shk
University of Toronto	https://kpe.utoronto.ca/faculty
University of Waterloo	https://uwaterloo.ca/kinesiology-health-sciences/about/people/group/24
University of Windsor	https://www.uwindsor.ca/kinesiology/440/faculty-members
Western University	https://www.uwo.ca/fhs/kin/about/faculty/index.html
Wilfred Laurier University	https://students.wlu.ca/programs/science/kinesiology-and-physical-education/faculty-and-staff.html
York University	https://health.yorku.ca/health-profiles/index.php?firstname=&surname&department=School+of+Kinesiology+%26+Health+Science&research_area=&keyword=&supervise=&submit=Search&search=Y

Note. *Institution Name* = University Name. *Website Link* = Uniform Resource Locator (URL) used to extract data for the following items listed in Section 2 of the coding manual: (a) Department_Faculty_Size (What is the total number of faculty listed as working in/affiliated with this department?); (b) Faculty_Expertise (How many faculty members in the department list physical activity for older adults in their areas of research interest or expertise?).

Table 3*Demographic variables describing institutional data for the sample*

<i>Institution Name</i>	<i>Founded</i>	<i>Enrolment</i>	<i>Ranking</i>	<i>Faculty</i>	<i>Expertise</i>
Brock University	1964	17737	Comprehensive	33	1
Lakehead University	1965	7053	Undergraduate (primarily)	8	0
Laurentian University	1960	7952	Undergraduate (primarily)	19	1
McMaster University	1887	29276	Medical/ Doctoral	19	3
Nipissing University	1992	4654	Undergraduate (primarily)	11	1
Ontario Tech University	2003	9577	Undergraduate (primarily)		
Queen's University	1841	24788	Medical/ Doctoral	22	1
Redeemer University	1982	896	None Provided	3	1
University of Guelph	1964	27291	Comprehensive	26	1
University of Ottawa	1848	34671	Medical/ Doctoral	29	2
University of Toronto	1827	72785	Medical/ Doctoral	33	1
University of Waterloo	1957	34681	Comprehensive	26	7
University of Windsor	1857	12356	Comprehensive	21	4
Western University	1878	32025	Medical/ Doctoral	27	1
Wilfred Laurier University	1911	18465	Comprehensive	18	1
York University	1959	49575	Comprehensive	48	4

Note. *Institution Name* = University Name. *Enrolment* = Undergraduate full-time and part-time student enrolment. *Ranking* = Maclean's ranking. *Faculty* = Full-time and part-time department faculty size (i.e., professor, associate professor, assistant professor). *Expertise* = Number of faculty in the department with expertise/ research interests in physical activity and older adults.

Table 4*Percentage of CKO's required courses*

CKO Required Courses	Percent 'Yes'
Human Biomechanics	100.0%
Human Psychomotor Learning/Neuroscience	100.0%
Exercise Physiology	93.8%
Health or Sports Psychology	93.8%
Ergonomics	93.8%
Principles of Nutrition	87.5%
Human Anatomy	81.3%
Human Physiology	81.3%
Assessment and Exercise Prescription	81.3%
Research Design, Methodology, and/or Statistics	81.3%
Pathology	6.3%

Note. There was no evidence of the code Unsure/Not Clear in this section of required courses. See Appendix A: Coding Manual for more details about coding of Unsure/Not Clear in this study.

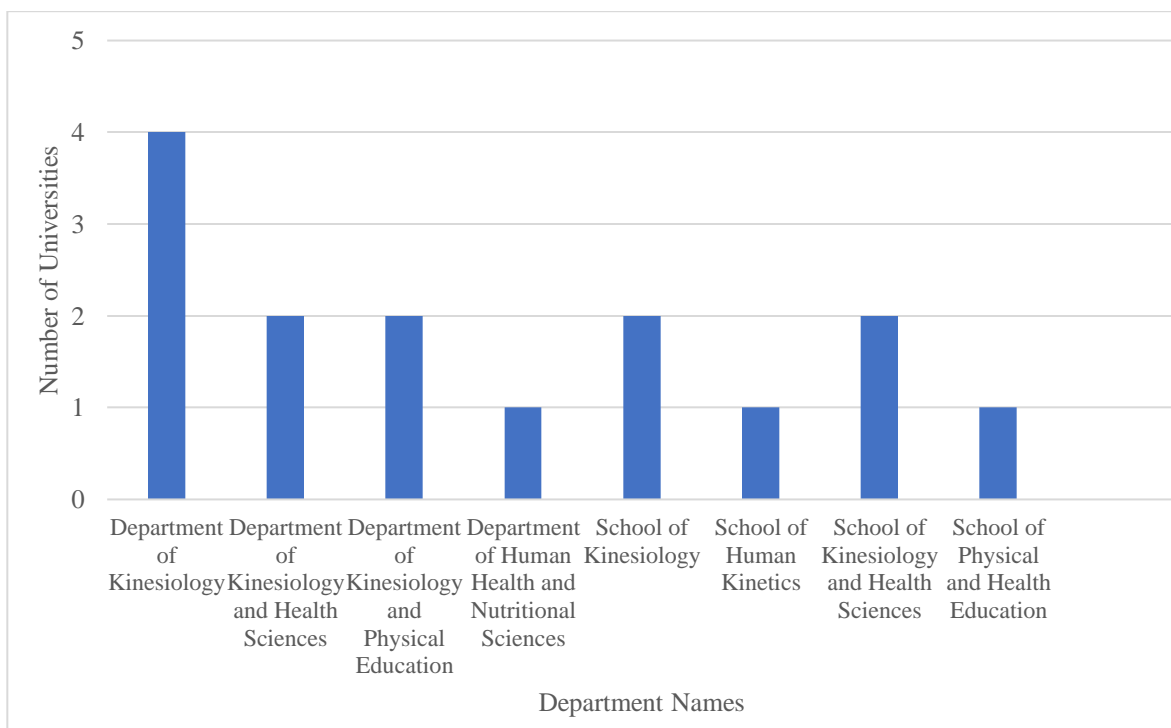
Table 5*Percentage of CKO's elective courses*

CKO Elective Courses	Percent 'Yes'
Other Kinesiology-Related Elective	100.0%
Gerontology/Physical Activity/Aging	81.3%
Practicum/Internship in Kinesiology	81.3%
Thesis/Independent Research Project in Kinesiology	81.3%
Sports Medicine and Rehabilitative Techniques	75.0%
Individual/Independent Study in Kinesiology	75.0%
Sociology of Movement/Exercise/Sport	68.8%
Health and Physical Activity	62.5%
Human Growth and Development	56.3%
Introduction to Kinesiology	37.5%

Note. There was no evidence of the code Unsure/Not Clear in this section of elective courses. See Appendix A: Coding Manual for more details about coding of Unsure/Not Clear in this study.

Figure 1

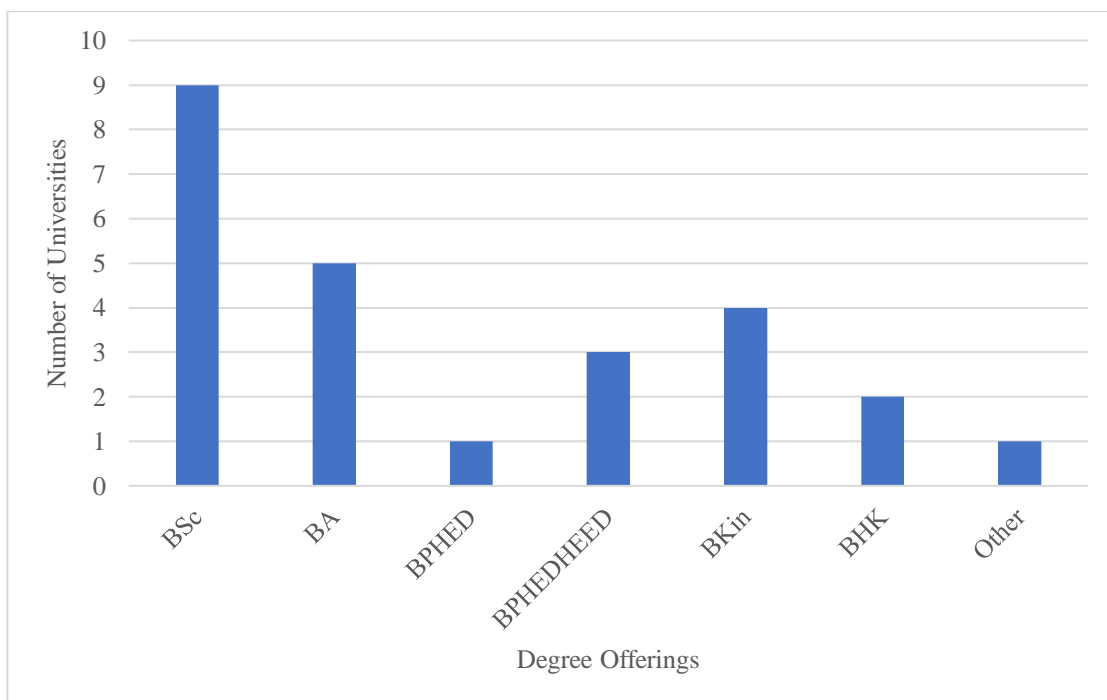
Bar graph denoting frequency of departmental names across the sample



Note. One university was excluded from the data presented in this bar graph due to the department/faculty name reported by the institution (i.e., Faculty of Health Sciences).

Figure 2

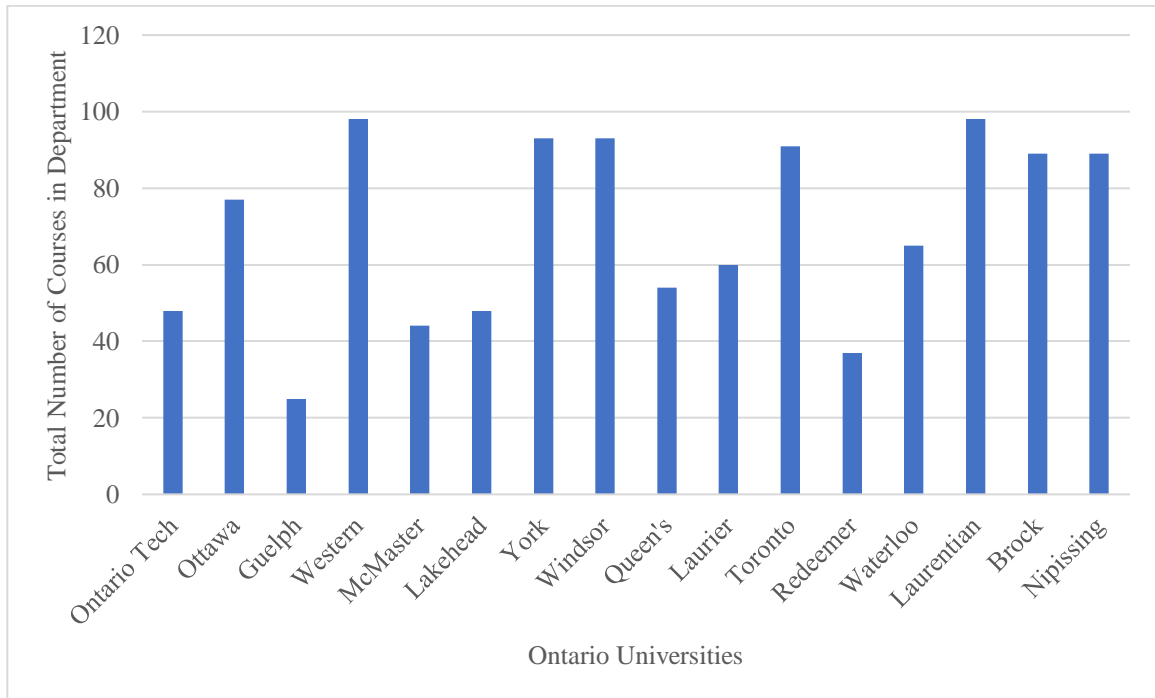
Bar graph denoting frequency of undergraduate degree options across the sample



Note. BSc = Bachelor of Science. BA = Bachelor of Arts. BPHEd = Bachelor of Physical Education. BPHEdHEED = Bachelor of Physical & Health Education. BKin = Bachelor of Kinesiology. BHK = Bachelor of Human Kinetics. Other = another equivalent degree.

Figure 3

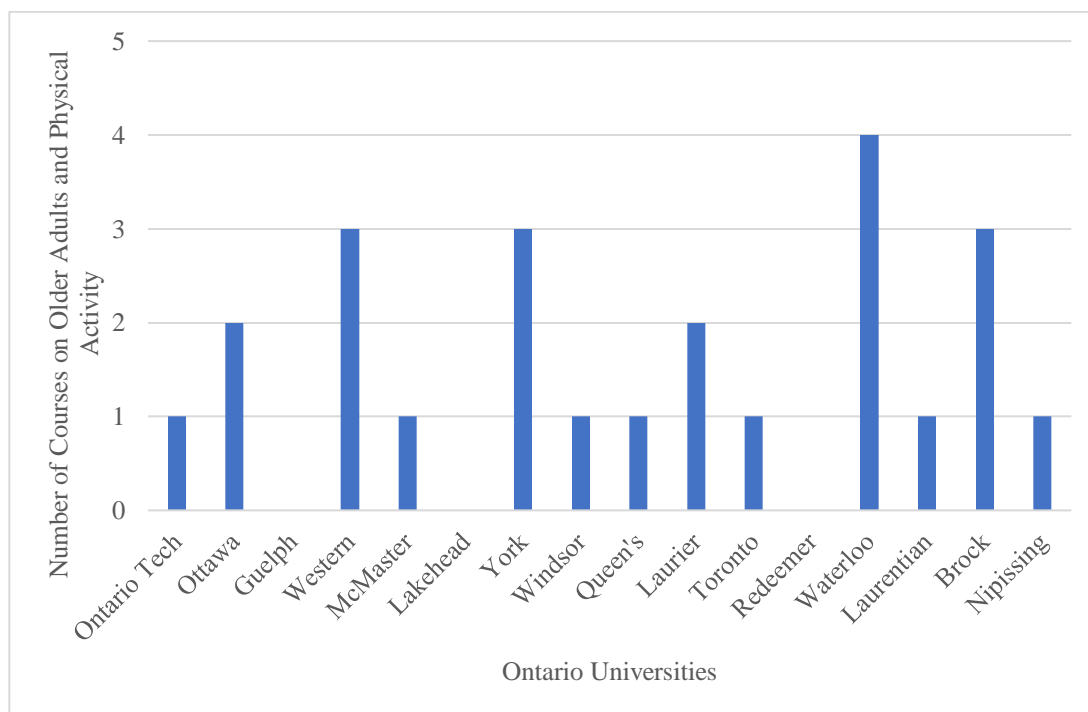
Bar graph denoting total number of courses per university offered in the kinesiology departments (or equivalent)



Note. This bar graph comes from the item coded as Department_Courses_Total in Section 4 of the coding manual presented in Appendix A.

Figure 4

Bar graph denoting number of undergraduate courses focused on older adult and physical activity offered within kinesiology departments (or equivalent) per university



Note. This bar graph came from the item coded as Course_OAPA_Number in Section 4 of the coding manual presented in Appendix A. The absence of a bar in each category signified that zero courses in older adults and physical activity were offered at these universities.

Appendix A: Coding Manual

SECTION 1: INSTITUTIONAL FILTERS

Disclaimer: The items within this section were used to determine a sample from the population of universities in Ontario (Canada) for the purposes of this study. This was accomplished mainly by application of the inclusion/exclusion criteria associated with this study.

Column __: Institution_Name (What is the official name of the institution?)

--

Column __: Institution_Classification (Is the institution classified as public or private by the Government of Ontario?)

- (1) Public
- (2) Private
- (3) Unsure/Not Clear

Note. This item is matched with the 'identification; stage of the modified PRISMA guidelines shown in Appendix B.

Column __: Department_Kinesiology (Does the institution have a department of kinesiology (or equivalent; e.g. Faculty, etc.) currently?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: Leave all other codes blank if this item is recorded as (2) No. This item is matched with the 'screening' phase of the modified PRISMA guidelines shown in Appendix B.

Column __: Undergraduate_Calendar (Is the undergraduate calendar publicly available via the internet to the public?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: Leave all other codes blank if this item is recorded as (2) No. This item is matched with the 'eligibility' phase of the modified PRISMA guidelines shown in Appendix B.

Column __: Calendar_Language (Is the undergraduate calendar available in English?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: Leave all other codes blank if this item is recorded as (2) No. This item is matched with the 'eligibility' phase of the modified PRISMA guidelines shown in Appendix B.

SECTION 2: INSTITUTIONAL BACKGROUND

Disclaimer: The items presented in this section were used as background to describe the university and/or department that was used to extract data for this study. These items were applied only to post-secondary institutions classified as eligible for this study based on the modified PRIMSA guidelines used in this study and displayed in Appendix B.

Column __: University_Year (What year was the university founded?)

Column__: University_Enrolment (What is the total part-time/full-time undergraduate enrollment at the university?)

Note: A total of all part-time and full-time undergraduate students enrolled in this university.

Column__: University_Macleans (How does Maclean's classify this university?)

- (1) Medical/Doctorate
- (2) Comprehensive
- (3) Undergraduate (primarily)
- (4) None provided
- (5) Unsure/Not Clear

Column __: Department_Name (What is the name of the department listed by the institution?)

Note. The department names will be recoded (Department_Name_Recoded) using a nominal level of measurement for the purposes of this study (e.g., (1) = Department of Kinesiology, (2) = Department of Kinesiology and Health Sciences, etc.).

Column__: Department_Faculty_Size (What is the total number of faculty listed as working in/affiliated with this department?)

Note: Total number of faculty (i.e., professors, associate professors, assistant professors.) listed within the department in full-time, part-time.

Column__: Faculty_Expertise (How many faculty members in the department list physical activity for older adults in their areas of research interest or expertise?)

SECTION 3: DEGREE OFFERINGS

Disclaimer: The items presented in this section were used as background to describe the diversity of undergraduate degrees offered by the department of kinesiology (or equivalent).

Column __: Degree_BSc (Does the department offer a BSc degree?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: BSc = Bachelor of Science

Column __: Degree_BA (Does the department offer a BA degree?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: BA = Bachelor of Arts

Column __: Degree_BPHEd (Does the department offer a BPHEd degree?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: BPHEd = Bachelor of Physical Education

Column __: Degree_BPHEdHEED (Does the department offer a BPHEdHEED degree?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: BPHEdHEED = Bachelor of Physical & Health Education

Column __: Degree_BKin (Does the department offer a BKIN degree?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: BKIN = Bachelor of Kinesiology

Column __: Degree_BHK (Does the department offer a BHK degree?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: BHK = Bachelor of Human Kinetics

Column __: Degree_Other (Does the department offer another equivalent degree?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

If so, what is the degree name?

Note: Other = A degree name offered in the department that is different from the other degree names provided in this coding manual.

SECTION 4: COURSES ON OLDER ADULTS AND PHYSICAL ACTIVITY

Disclaimer: The items presented in this section were used as focal content to extract and code data on courses for older adults and physical activity for this study.

Column__: Department_Courses_Total (What is the total number of undergraduate courses taught by this department based on the information provided in the course calendar?)

Note: Total number of undergraduate courses taught by the department across any/all degree programs promoted within the department based on information provided in the course calendar.

Column __: Course_OAPA (Does the department offer a course focused on physical activity and older adults?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: If yes, the total amount of how many courses focus on physical activity and older adults will be shown in Column__: Course_OAPA_Number.

Column __: Course_OAPA_Specialization (Is the course focused on physical activity and older adults targeted at a subset of the older adult population [e.g., Alzheimer's Disease]?)

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Note: If yes, the total amount of how many courses focus on physical activity adults targeted at a subset of the older adult population will be shown in Column__: Course_OAPA_Specialization_Number.

SECTION 5: CKO-COURSES/CONTENT

Disclaimer: The items presented in this section were used as background to describe the ratio of courses specific to older adults and physical activity taught with reference to required courses and elective courses denoted by the CKO.

Each of the required courses (1-11) and elective courses (1-10) will be coded as follows:

- (1) Yes
- (2) No
- (3) Unsure/Not Clear

Column__: Course_Required (Does a course focus on these areas?)

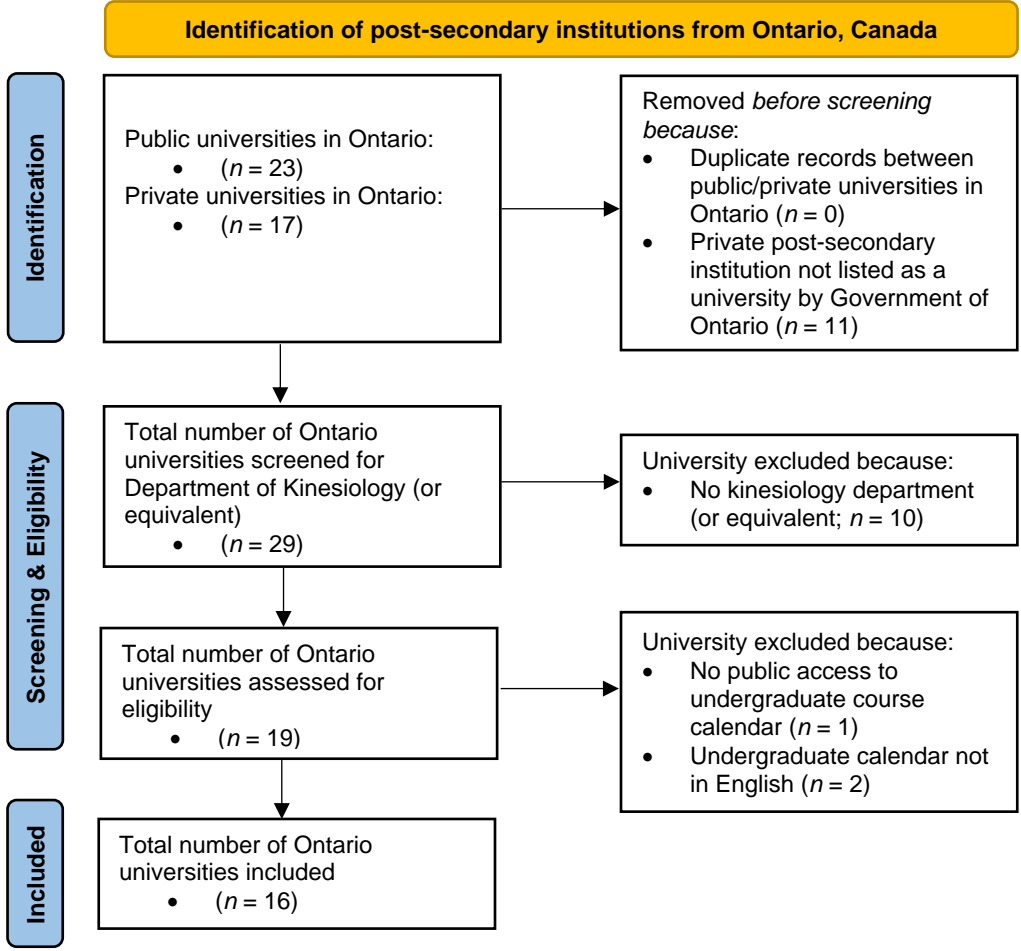
- (1) Human Anatomy (Column__: Course_HUMANANATOMY)
- (2) Human Physiology (Column__: Course_HUMANPHYSIOLOGY)
- (3) Biomechanics (Column__: Course_BIOMECHANICS)
- (4) Psychomotor/Neuroscience (Column__: Course_MTLNEUROSCIENCE)
- (5) Exercise Physiology (Column__: Course_EXPHYSIOLOGY)
- (6) Assessment and Exercise Prescription (Column__: Course_ASSESSEXPRESCRIPTION)
- (7) Health or Sport Psychology (Column__: Course_HEALTHSPORTSPSYCH)
- (8) Pathology (Column__: Course_PATHOLOGY)
- (9) Ergonomics (Column__: Course_ERGONOMICS)
- (10) Nutrition (Column__: Course_NUTRITION)
- (11) Research Design, Methodology and/or Statistics (Column__: Course_RESDESSTATS)

Column__: Course Elective (Does the course focus on these areas?)

- (1) Introduction to Kinesiology (Column__: Course_KINESINTRO)
- (2) Health and Physical Activity (Column__: Course_HEALTHPHYS)
- (3) Human Growth and Development (Column__: Course_GROWTHDEVELOP)
- (4) Gerontology/Physical Activity/Aging (Column__: Course_AGING)
- (5) Sociology of Movement/Exercise/Sport (Column__: Course_SOCIO)
- (6) Sports Medicine and Rehabilitation Techniques (Column__: Course_SPMEDREHAB)
- (7) Individual/Independent Study in Kinesiology (Column__: Course_INDSTUDY)
- (8) Practicum/Internship in Kinesiology (Column__: Course_PRACTINTERN)
- (9) Thesis/Independent Research Project in Kinesiology (Column__: Course_THESISRESPROJ)
- (10) Other Kinesiology-Related Elective (Column__: Course_OTHER)

Appendix B

Modified PRISMA Flow Diagram for this study.



Appendix C

Example: Selection of courses to code for this study.

This illustration used current data from the 2021-2022 undergraduate calendar published by the University of Waterloo for the Department of Kinesiology (see this weblink for details: <https://ucalendar.uwaterloo.ca/2021/COURSE/course-KIN.html>):

Course Code	Course Title/Course Description
KIN342	<p><i>Nutrition and Aging</i></p> <ul style="list-style-type: none"> This course provides an overview of the <i>nutrition</i> and <i>food</i>-related issues, recommendations and best practices for older adults throughout the continuum of care (community to long term care). Determinants of <i>food intake</i> are a focus with specific consideration given to <i>eating</i> environment, psychosocial and physiological changes that influence access, preparation, and <i>consumption of food</i>. An emphasis will be placed on chronic disease prevention and management of <i>nutrition issues</i> and challenges throughout the continuum of care.
KIN418	<p><i>Physical activity and Aging</i></p> <ul style="list-style-type: none"> This course will discuss common physical, mental, and social changes with aging, and the <u>implications of physical activity</u> on these changes. Students will understand and evaluate the barriers to <u>physical activity among older adults</u> and develop strategies to improve physical activity participation at the individual, community, and population level.
KIN493	<p><i>Clinical Kinesiology: Movement Assessment Practicum</i></p> <ul style="list-style-type: none"> Practical experience in movement assessment of persons from various special populations such as the normal elderly and those with neurological, degenerative, or developmental disorders. Motor functions involving gait, posture, and balance or upper-limb movements will typically be examined in these assessments.

Using the data provided in this example, the following decisions were made regarding these courses for use in this study:

1. KIN342 was coded as unclear based on the level one (i.e., course title examination only) stage in the coding process as the focus of the class based on the course title was on (a) the aging population but does not mention (b) physical activity. The course then moved to level two (i.e., course description examination only). This course was not included in the study as the focus of the course based on the course description was (a) on older adults but (b) directed at nutrition as opposed to physical activity. The italicized quotes in table provided illustrations of this issue for the reader.

2. KIN418 was coded as a yes in level one of the coding stage as the course title expressed both (a) the aging population and (b) physical activity. The course then moved on to level two screening and was included for this study as course content expressed clear focus (see underlined quotes in table for KIN418) on (a) older adults, and (b) physical activity.
3. KIN493 was unclear for this study based on level one screening. The course title had no synonyms for (a) older adults listed but (b) 'movement' was. Based on level two examination of the course description, the course was not included in this study as it was unclear if the various special populations was only with (a) the elderly population or if this population specifically was just an example that was given for this course.

Appendix D

Letter of Exemption from Research Ethics Board



Brock University
Office of Research Ethics
Tel: 905-688-5550 ext. 3035
Email: reb@brocku.ca

Health Science Research Ethics Board

DATE: November 19, 2021
FROM: Stephen Cheung, Chair
TO: WILSON, Philip - Kinesiology
FILE: 21-132 - WILSON
Masters Thesis/Project
TITLE: What's out there? Kinesiology curriculum scan for physical activity and older adults in Ontario

On behalf of the Brock University Health Science Research Ethics Board (HREB), the Office of Research Ethics has conducted a review of the above titled proposal and has reached the following decision:

DECISION: Project Exempt

Upon review it has been determined that this project does not require ethics clearance due to the reason(s) stated below:

- Article 2.1 – in that the research does not involve human participants; and,
- Article 2.2 – wherein the research relies exclusively on publicly available information and there is no expectation of privacy.

While not strictly necessary, you may want to indicate that the study has been reviewed by the Brock University Research Ethics Board (REB file# 21-132) and found to be exempt on all documents, in case participants have questions.

Thank you for submitting your application to the Brock University Health Science Research Ethics Board.

Lori Walker, MED, OCT
Manager, Research Ethics
Brock University | Office of Research Ethics
Niagara Region | 1812 Sir Isaac Brock Way | St. Catharines, Ontario L2S 3A1
brocku.ca | T 905 688 5550 x 3035