INFLUENCE OF CHRONOLOGICAL AGE ON PHYSICAL ACTIVITY RECOMMENDATIONS: AN EXPERIMENTAL CASE STUDY APPROACH

ARUN ESWARAN

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Abstract

Chronological age influences clinical decision making among healthcare professionals. Previous research uses case-study vignettes to assess clinical decision making differences based on chronological age. The objective of this study was to extend this research method to clinical physical activity (PA) and: a) assess if PA recommendations differ based on chronological age, and b) explore some moderating effects of this relationship. Participants were randomly assigned to one of four case-study vignettes that described a case "patient" with prediabetes who was referred to an exercise professional (the participant) for a PA recommendation. The four vignette conditions described the patient as either a 20-year-old, 42-year-old, 74-year-old, or no age was indicated. There were significant results for PA duration and intensity, with significant decreases for the 74-year-old condition when compared to the three other conditions. Some significant moderating factors were also observed. Findings suggest that ageism may exist within PA recommendation practices.

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“The Lord is my strength and my shield; in him my heart trusts; so I am helped, and my heart exults, and with my song I give thanks to him.” (Psalm 28:7 New Revised Standard Version).

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List of Abbreviations

AACE	American Association of Clinical Endocrinologists
AAS	Ambivalent Ageism Scale
ANOVA	Analysis of Variance
CSEP	Canadian Society for Exercise Physiology
HCP	Healthcare Professional
KURE	Kinesiology Undergraduate Research Experience
PA	Physical Activity
ROPE	Relating to Older People Evaluation

Introduction

Ageism

Originating the term, Butler (1969) defined *ageism* as "prejudice by one age group towards other age groups" (p. 243). In this definition, ageism affects all age groups including young and middle-aged adults but typically refers to the prejudice towards older adults. To reflect the prejudice against older adults, Butler (1975) later updated this definition as "a process of systematic stereotyping and discrimination against people because they are old, just as racism and sexism accomplish this for color and gender" (p. 48). Several other definitions of ageism have been introduced since Butler's work, but Butler's definition is theorized as the "ultimate definition" (Iversen, Larson, & Solem, 2009, p. 6).

Butler's (1975) definition of ageism does not capture the evolving complexities of the concept. Ageism is a complex construct due to cognitive (stereotypes), emotional (prejudice), and behavioural (discrimination) manifestations that reinforce societal inequalities (Barnett, 2005; Iversen et al., 2009). More recent definitions of ageism now focus on addressing the complexities of the aging process and age discrimination. For example, the definition of ageism by Heikkinen and Krekula (2008) states that "the three most central elements of ageism are prejudices, discriminatory practices, and asymmetric power relations" (p. 22).

Ageism has been identified at two different levels: individual and societal (Ayalon & Tesch-Römer, 2017). At the individual level, ageism stems from the internalization of age stereotypes. This internalization of age stereotypes can start as early as the fourth grade, where children internalize negative views of older adults (Ayalon & Tesh-Römer, 2017). As children grow older, they continue to hold onto these negative views into late adulthood. At the societal level, ageism is present in healthcare and the labour force (Ayalon & Tesh-Römer, 2017).

Ageism in healthcare has grown with the increased healthcare utilization and costs among older adults, which is expected to increase further with an aging population (Ayalon & Tesh-Römer, 2017). Ageism can lead to differential treatments and can limit the availability of healthcare services for older adults. In the labour force, older adults are viewed as costly and less productive workers (Ayalon & Tesh-Römer, 2017). Older adults also have more difficulties finding a job and are often the first ones laid off due to a recession (Ayalon & Tesh-Römer, 2017). At the societal level, ageism can be attributed to economic motives (Levy, Slade, Chang, Kannoth, & Wang, 2020).

Ageism and Health

Stereotype embodiment theory suggests that stereotypes are embodied from the cultural environment to influence functioning and health throughout the aging process (Levy, 2009). This theory states that "stereotypes (a) become internalized across the life span, (b) can operate unconsciously, (c) gain salience from self-relevance, and (d) utilize multiple pathways" (Levy, 2009, p. 333). The internalization of positive and negative age stereotypes during early and middle adulthood can predict health outcomes later in life (Levy, 2009). Research has found that older adults with more positive self-perceptions of aging had better functional health and lived an average of 7.5 years longer, when compared to older adults with more negative self-perceptions of aging (Levy, Slade, & Kasl, 2002; Levy, Slade, Kunkel, & Kasl, 2002). As such, there is a need to understand how negative age stereotypes are reinforced and to develop interventions aimed at reducing negative age stereotypes.

Within the context of healthcare, the operationalization of ageism excludes self-directed and implicit ageism (São José, Amado, Ilinca, Buttigieg, & Taghizadeh Larsson, 2019). Self-directed ageism would refer to the refusal of diagnostic procedures and treatments due to one's

negative self-perception of aging. Self-directed ageism is also implicit as it operates at an unconscious level. Implicit ageism at the healthcare provider-level involves the assumptions that older adults do not fit into the hospital environment and that they cannot tolerate treatments as well as younger patients. A review of the literature on ageism and age discrimination in primary and community healthcare in the United Kingdom states that "[a]ge barriers are often implicit rather than explicit so that simply removing age criteria from clinical protocols and guidelines will not necessarily eliminate ageist practices. Implicit discrimination at the individual, clinical level is harder to assess" (Clark, Hayes, Jones, & Lievesley, 2009, p. 11). The barrier in assessing implicit discrimination at an individual clinical level, suggests that there is a need for research to identify and measure implicit manifestations of age discrimination to effectively manage ageism in healthcare.

Ageism in Healthcare Practices

Research has identified that older adults often face discrimination at multiple levels of the healthcare system due to their age. Ageism in healthcare directly affects older adults through healthcare policies, healthcare services, and healthcare provider decision making. More specifically, at an institutional and policy level, healthcare policies tend to focus on biomedical aspects (e.g., assumption that all illness is secondary to disease) of aging instead of bio-psycho-social (e.g., recognition of psychosocial factors that influence illness) aspects of aging (Wade & Halligan, 2004). Clinical practice guidelines that are used by clinicians to treat and diagnose older adults' illnesses and injuries did not evolve from research with older adults. Clinicians tend to use guidelines that were developed for younger adults, although there is no evidence for the generalizability of these guidelines to older adults (Mutasingwa, Ge, & Upshur, 2011). At an organizational level, older adults are often excluded from clinical trials and clinics limit the

number of older adults they service (Chang et al., 2020). At an interpersonal level, healthcare providers engage in elderspeak (slower/louder speech and patronizing tone), missed diagnoses (attributing pathology as a normal part of aging), inappropriate use of drugs (polypharmacy), under-treatment, and over-treatment (Schroyen et al., 2018). Healthcare providers are also less likely to recommend health promotion and disease prevention strategies for older adults (Greene & Adelman, 2003). Ageism at all levels of the healthcare system has significant effects on the health outcomes of older adults.

Poor health outcomes of older adults can often be attributed to ageist healthcare practices, such as under-treatment (Peake, Thompson, Lowe, & Pearson, 2003; Shumway & Hamstra, 2015; Swaminathan & Swaminathan, 2015). Under-treatment among older adults can also be considered a form of therapeutic nihilism. Therapeutic nihilism is the idea that interventions should only be provided to those who will recover and live long lives (Kane, 2004). Therapeutic nihilism is rooted in cost-benefit analysis, which assumes that treatment will not affect older adults, and taxpayers' dollars should not be used to provide interventions for this population. This assumption is why many healthcare providers choose to limit the number of older adults permitted within their clinics, as the costs often outweigh the benefits to provide care for this population. Older adults in the healthcare system tend to have multiple co-morbidities and take more time during healthcare visits, as such, working with older patients is not as profitable as working with younger patients. Research has identified therapeutic nihilism in the following areas of treatment: palliative geronto-oncology, STEMI (ST-Elevation Myocardial Infarction) care, and urinary tract infection management (Biskup, Vetter, & Wedding, 2019; Crnich, Jump, & Nace, 2017; Gupta, 2016). Therapeutic nihilism is present in various areas of healthcare and leads to the under-treatment of older adults.

Ageism and Diabetes

Type 2 diabetes is a chronic disease in which the body cannot produce enough insulin, the hormone that regulates blood glucose levels. Prior to a diagnosis of type 2 diabetes, patients are considered to have prediabetes. Prediabetes occurs when blood sugar levels are higher than normal, but not high enough to be diagnosed with type 2 diabetes (Tabák, Herder, Rathmann, Brunner, & Kivimäki, 2012). It is estimated that prediabetes affects 2.5 million Canadians (Ohinmaa, Jacobs, Simpson, & Johnson, 2004). If prediabetes is left unmanaged it can progress into type 2 diabetes. However, there are prevention strategies that can be used to either slow down or stop this progression (Tabák et al., 2012). Prediabetes can be effectively managed by following a healthy diet, exercising regularly, and losing weight. It should also be noted that adults over the age of 40 years are at an increased risk of developing prediabetes and type 2 diabetes (Ekoe, Goldenberg, & Katz, 2018). As such, it is recommended that anyone over the age of 40 should be regularly tested for diabetes (Ekoe et al., 2018).

Ageism costs the American economy $63 billion a year in healthcare expenses and leads to 17.04 million cases of health conditions (Levy et al., 2020). Among older adults in the United States, age discrimination contributed to 309,528 cases of diabetes mellitus and negative age stereotypes contributed to 929,077 cases of diabetes mellitus (Levy et al., 2020). This is one of the first studies to report an association between ageism and diabetes mellitus, thus, it is not clear how ageism contributes to cases of diabetes mellitus (Levy et al., 2020). The risk of diabetes mellitus among adults can be significantly reduced by losing weight through dietary interventions and physical activity (CDC, 2020). Considering the prevalence of diabetes cases as a result of ageism, there is a need to reduce negative age stereotypes and promote primary prevention strategies for older adults who may be at risk for developing diabetes mellitus.

A study by Kokoszka and Kot (2007) examined the relationship between a patient's age and intensity of type 2 diabetes treatment. The study participants included 1,199 type 2 diabetes patients who were beginning insulin therapy. The intensity of treatment was measured by the number of insulin injections required per day. A one-injection insulin therapy model, which uses one injection of long-acting insulin a day, is the simplest model of therapy. More advanced models use multiple injections a day to mimic natural physiological changes in insulin levels. The advanced models are also associated with reducing the effects of high blood sugar levels. This study found that older adults received the less intensive one-injection treatment more often than younger patients. Results also revealed that older adults had diminishing glucose level control when compared to younger patients, because of the less intensive insulin therapy model. The researchers suggested that prejudices related to older adults' cognitive functioning contributed to age-related differences in treatment. However, there is no research or evidence to suggest that cognitive declines among older adults should limit the availability of treatment options in diabetes care (Kokoszka & Kot, 2007). Within the diabetes and ageism literature, ageism has been implicated in the less-than-optimal prevention and management of type 2 diabetes.

Physical Activity and Healthcare

Physical activity plays an important role in the well-being of older adults, as it has the ability to prevent multiple chronic conditions (e.g., diabetes, osteoporosis, hypertension, cardiovascular disease) (Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). The effects of physical activity are comparable to drug interventions in many health conditions (Lobelo et al., 2018). Despite the health benefits associated with physical activity, only 13.1% of older adults aged 60 to 79 in Canada met recommended physical activity guidelines (Statistics Canada,

2011). A systematic review of physical activity in older people also found that older groups were less likely to be regularly active than younger groups (Sun, Norman, & While, 2013).

Globally, physical inactivity is estimated to cost $53.8 billion to healthcare systems and 13.4 million disability-adjusted life-years (Ding et al., 2016). In 2009, the estimated cost of physical inactivity in Canada was approximately $6.8 billion, which represents 3.7% of overall healthcare costs (Janssen, 2012). There is also a 26.6% difference in healthcare expenditures when comparing an active adult to an inactive adult (Carlson, Fulton, Pratt, Yang, & Adams, 2015). From an economic perspective, there is a need to promote physical activity to reduce healthcare expenditure and improve quality of life.

In Ontario, the Aging with Confidence Action Plan for Seniors has a focus on promoting physical activity for older adults. This initiative encourages older adults to maintain an active lifestyle to help prolong independence, manage chronic conditions, and to prevent other health conditions (Government of Ontario, 2017). Through this action plan, the Government of Ontario is providing additional funding for programs focused on physically active recreation activities for older adults (Government of Ontario, 2017). At a healthcare system level, institutions are responding to the decreases in physical activity among older adults. There are now more federal and provincial programs targeted at promoting physical activity among older adults (Government of Ontario, 2017). However, there are no provincial or federal initiatives focused on promoting physical activity in clinical healthcare contexts (e.g., community health centres, family medicine clinics, hospitals, etc.), specifically targeting healthcare providers who make physical activity recommendations.

Clinical Physical Activity

Kinesiologists are healthcare providers who work with people of all ages and physical abilities to help them achieve their health and wellness goals, and improve quality of life. In Ontario, the *Kinesiology Act* (2007) defines their scope of practice as "the assessment of human movement and performance and its rehabilitation and management to maintain, rehabilitate or enhance movement and performance" (c.10, Sched. O, s. 3.). Kinesiologists provide services in hospitals, family health teams, fitness centres, rehabilitation clinics, long-term care homes, community care, and private practice. To legally practice in Ontario, kinesiologists must register with the College of Kinesiologists of Ontario, making them regulated health professions under the *Regulated Health Professions Act (RHPA)* (1991).

Competencies in health professions are the skills, knowledge, and personal characteristics required for entry-to-practice in a regulated health sector. One of the core competencies of kinesiologists in Ontario is that they must be able to provide prescriptions in physical activity to prevent and treat chronic conditions (Prevost, Kpazaï, & Attiklemé, 2015). This practice falls under Competency 2, which states that kinesiologists must be able to "apply knowledge of human movement and performance as it relates to health promotion, and to the prevention and treatment of chronic and other diseases and injury" (College of Kinesiologists of Ontario, 2013, p. 3). This competency was ranked as the most important competency in the practice of kinesiology among kinesiology faculty members in Ontario (Prevost et al., 2015). Kinesiologists use best practice guidelines to apply current evidence-based knowledge in the prescription of physical activity (Prevost et al., 2015).

The Canadian Society for Exercise Physiologists (CSEP) Physical Activity Guidelines suggest that older adults engage in 150 minutes of moderate-to-vigorous intensity aerobic

physical activity per week (Tremblay et al., 2011). Further, the American Association of Clinical Endocrinologists (AACE) management of prediabetes guidelines recommend that adults engage in regular moderate intensity physical activity for 30 to 60 minutes daily, at least five days per week (i.e., 150 minutes per week minimum) (Handelsman et al., 2015). The primary goals of these guidelines in prediabetes management are to normalize blood glucose levels, delay progression to diabetes, and prevent associated microvascular complications (Handelsman et al., 2015). Within these evidence-based best practice guidelines, there are three main factors that contribute to the magnitude of physical activity: frequency, duration, and intensity. As such, these three factors play an important role in physical activity recommendations in the practice of kinesiology and physical activity prescription for type 2 diabetes management.

The Role of Experience and Education

Education on and experience with older adults have a significant effect on ageist attitudes in healthcare practices. Research has identified that these two factors are expected to reduce ageism among healthcare and social service providers (Levy, 2016). Education about older adults and aging needs to focus on positive aspects of aging and inform learners about inaccurate stereotypes. Additionally, positive experiences and interactions with older adults are essential to fostering positive attitudes towards aging (Levy, 2016). The literature shows that experiences with older adults that are individualized, equal status, cooperative, and involve sharing personal information are the most effective in reducing ageist attitudes. Research on anti-ageism interventions for health professions students has found that combining aging education with positive experiences working with older adults is effective in reducing ageism among future healthcare professionals (Levy, 2016; Lytle & Levy, 2019). This model of education is called the PEACE (Positive Education about Aging and Contact Experiences) model. The PEACE model

focuses on providing students with education that focuses on positive aspects of aging and positive contact experiences (Levy, 2016). As such, undergraduate and professional health education in gerontology and aging has a significant influence on attitudes towards aging (Giles, Paterson, Butler, & Stewart, 2002).

Although there is an increase in gerontology education and experiences with older adults in professional health education, it is still not clear what magnitude of education and experience is necessary to overcome ageist healthcare practices. Further research is required within this area to design interventions that effectively reduce ageist attitudes among students in health professional programs and practicing healthcare professionals.

Case Vignettes to Measure Ageism in Healthcare Recommendations and Practices

To better understand point-of-care clinical decision making, research has analyzed data from medical records, administrative/insurance claims, and standardized patients (Converse, Barrett, Rich, & Reschovsky, 2015). Medical record abstraction is when a trained medical chart abstractor reviews clinical records to create a dataset of physician decisions. Medical record abstraction can be costly and there is also the risk of not capturing medical data that may not be recorded. Similarly, administrative claims can be used as a record of point-of-care decisions, but these claims do not include any clinical data such as patients' symptoms or medical histories that can influence physicians' decisions. Standardized patients are trained actors who are asked to portray a specific patient case during a clinical visit and to document the services they received during their visit. This method is often considered the "gold standard" to measuring physician decisions but it is very costly to train and compensate standardized patients. Due to the cost and logistical challenges associated with these data sources, clinical vignettes have been used to assess clinical decision making (Converse et al., 2015). Clinical vignettes are cost-effective and

provide greater detail into clinical decision making, while also allowing for larger sample sizes. They are also an effective method of measuring implicit ageism in healthcare contexts at an individual clinical level. As such, recent research has used clinical case studies to assess healthcare providers' treatment decision making based on patient age.

One study examined physical activity recommendations of therapy students (occupational therapy and physiotherapy) for older adults with persistent low back pain (Ryan, Schofield, & Martin, 2013). This study used a cross-sectional online design to compare two vignette groups: a 40-year-old and a 70-year-old patient. The study found that there were no significant differences between the younger and older vignettes for overall appropriate physical activity recommendations. Researchers in this study suggested that there were no age-related differences because the vignette ages were not sufficiently polarized (e.g., not enough contrast between the two age groups). Increasing the age gap between the two vignette patients could have resulted in a significant difference between the groups.

Another study used a similar methodology to assess treatment attitudes and decisions of student psychotherapists based on a patient's age (Kessler & Schneider, 2017). This study compared a 79-year-old patient with a 47-year-old patient in the clinical vignettes, with both patients seeking psychotherapy treatment for symptoms of anxiety and depression. This study had similar findings, with no significant differences between the two age groups for treatment attitudes. There were some differences in the therapeutic approach (therapy length, motivational clarification, clarifying techniques) in the two age groups that may account for the lack of between group differences in treatment attitudes of student psychotherapists.

Kane (2004) also used a vignette methodology but looked at assessment and treatment attitudes among social work students. Two different vignettes were used; the patient was

described as either 38 years old or 72 years old. Aside from the age of the patient, the vignettes were identical. The patient in the vignette has recently been diagnosed with a serious form of cancer and believes that euthanasia is their best option. The findings revealed that more students believed the older patient should be allowed to euthanize when compared to the younger patient. Overall, there was greater support for the older patient to undergo euthanasia and less support for psychotherapy or other forms of intervention.

A study exploring ageism and caring attitudes among nurses in oncology found significant differences between an older patient and middle-aged patient in various treatment options (Schroyen, Missotten, Jerusalem, Gilles, & Adam, 2016). The study compared a 40-year-old patient with a 70-year-old patient for the case vignette conditions. Again, the vignettes for both conditions were identical, apart from the ages of the patients. The results indicated that nurses who specialized in oncology had lower levels of support for immunotherapy, adjuvant chemotherapy, and breast reconstruction for the older patient. Although this study did not examine physical activity interventions, it is possible that clinicians may select less intensive physical activity interventions for older patients.

Within the ageism and clinical vignette literature, there is no conclusive evidence on differences in clinical decision making with different age groups. There is also no information on treatment decisions across the lifespan, as most studies just compare a middle-aged patient with an older adult patient. This further limits the understanding of age-based clinical decision making within the literature. Additionally, it is not clear whether there are specific factors within the study samples that could be potentially reducing ageist healthcare practices (e.g., positive experiences working with older adults or education in aging and gerontology).

Research Gaps

There is currently no research on how healthcare providers make treatment decisions without any knowledge of a patient's age or how they treat someone of their own age. Previous studies have not added a control group to the clinical vignette conditions. This addition could provide insight into why previous studies have not found significant differences between age groups. Additionally, the age difference between a middle-aged adult and an older adult may not be obvious to clinicians or health professions students. For example, for a college-aged student, the age difference between a 40-year-old and a 70-year-old may not be significant enough to reveal age-related differences in clinical decision making. Further, previous studies have not examined how aging education, experiences with older adults, and aging attitudes affect treatment recommendation practices.

Additionally, research that has sampled students has not examined if there is a difference in recommendation practices for students who plan on becoming practicing healthcare professionals when compared to students who plan on going into other careers. The current literature in this area of research also focuses on age-related differences in treatments for conditions that have been diagnosed, instead of using primary prevention strategies (e.g., physical activity, dietary interventions, and stress management) to prevent or slow down disease progression. As mentioned above, physical activity has been identified as an effective primary prevention strategy for prediabetes, but there is little to no research on the age-related implicitly-biased differences in physical activity recommendation practices.

Research Objectives

The objective of this study was to extend this area of research to clinical physical activity decision making in prediabetes management and: a) assess if PA recommendations (physical

activity frequency, support, duration, and intensity) differ based on chronological age (specifically looking at the addition of a 20-year-old age group and a no-age group), and b) explore some potential moderating effects (e.g., participants' age, gender, physical activity levels, future career goals, aging attitudes, aging education, and experiences with younger and older adults) of this relationship. This study aimed to explore the following research questions in a sample of kinesiology students:

a) Are there age-related differences in the management of prediabetes using the following physical activity recommendation factors?
    a. Frequency of physical activity (days per week)
    b. Duration of physical activity (minutes per physical activity session)
    c. Intensity of physical activity (level of exertion during physical activity session)
    d. Support for physical activity recommendations (level of support for recommended physical activity participation)
b) Is the relationship between a patient's age and physical activity recommendations for prediabetes management moderated by the participants' age, gender, personal physical activity levels, future career goals, aging attitudes, or experiences with younger and older adults?

Due to the inconclusive findings in the current literature examining the relationship between ageism and clinical decision making, no specific anticipated hypotheses were proposed in this study.

Methods

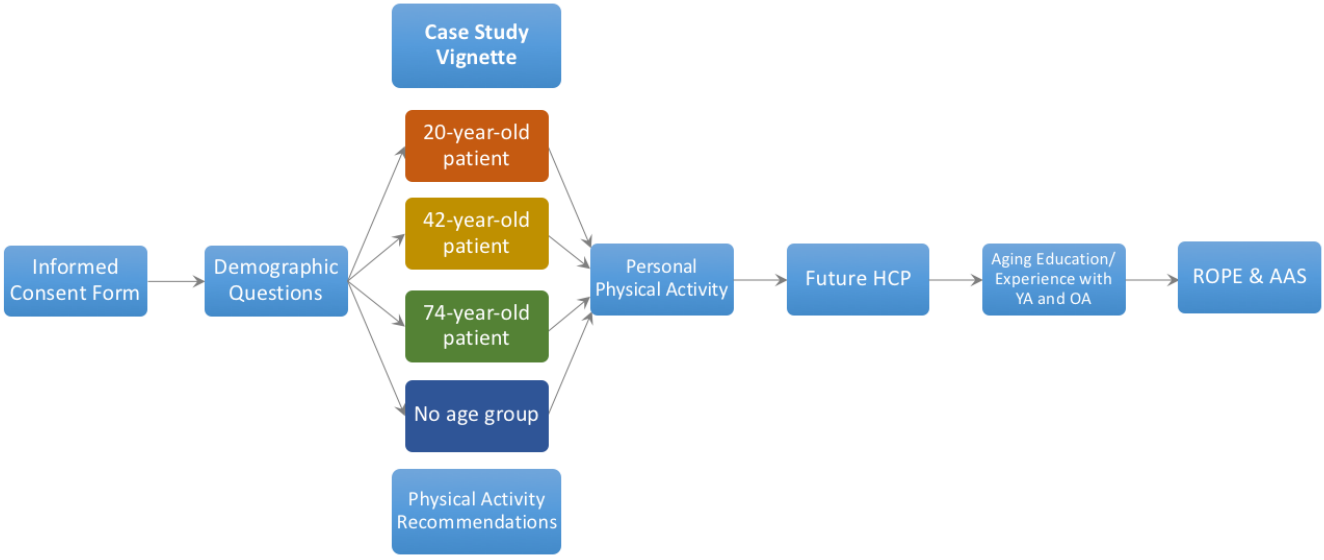
Participants

Participants were recruited from the Kinesiology Undergraduate Research Experience (KURE) at York University. This participant pool consists of undergraduate kinesiology students enrolled in KINE 2049 (Research Methods in Kinesiology). As such, the only inclusion criteria for this study was that participants must be enrolled in KINE 2049 for the Fall 2019 term. This participant pool operated from September 11, 2019, to December 1, 2019, with approximately 750 students. Recruitment for this study started on October 8, 2019 and ended on December 1, 2019. Participants signed up for the study online and completed the study online using Qualtrics. Upon completion of the study, participants received 1.5 credits on the KURE system, which is equivalent to 1.5% towards their final grade in KINE 2049. If a participant provided consent to participate and withdrew from the study, they were still remunerated for their time. The target sample size was determined based on previous literature using clinical case vignettes to examine age-related differences in healthcare. Previous studies had between 40 and 50 participants for each age-group condition, the current study has four conditions, thus the target sample size was between 160 and 200 for the current study. However, participant recruitment continued when the target sample size was reached and ended once the participant pool closed.

Study Design and Procedure

Figure 1

Study Procedure Diagram



Note. HCP: Healthcare Professional; YA: Younger Adults; OA: Older Adults; ROPE: Relating to Older People Evaluation; AAS: Ambivalent Ageism Scale

This study is an experimental, cross-sectional online survey. The online survey took approximately 30 minutes to complete. The first part of the survey was an informed consent form. Following this, participants were asked to answer demographic questions. The next section of the survey was a clinical vignette describing a patient who has high blood sugar levels (prediabetes) and explained that the patient is referred to a qualified exercise professional (the participant) for a physical activity intervention. The clinical vignette reads as follows:

> For this case study, imagine that you are a qualified exercise professional working in a community health centre with an interdisciplinary healthcare team of a physician, a nurse,

> a nutritionist, and a social worker. One day, a [(randomly assigned) = *"20 year-old patient" (OR) "42 year-old patient" (OR) "74 year-old patient" (OR) "patient"*] is referred to you by one of your healthcare team members because the patient's most recent bloodwork shows that they have pre-diabetes. Your healthcare team member referred this patient to you, as a qualified exercise professional, to help them manage their blood glucose levels through aerobic physical activity. *Assume that this patient is new to exercise and has no other health conditions, diseases, or disorders, and they can be treated in an ideal setting without any barriers to receiving care. Assume that you are qualified to provide physical activity recommendations for the following questions.*

The format and wording used in this clinical vignette was based on previous literature using clinical vignettes to assess age-related differences (Converse et al., 2015; Kane, 2004; Kessler & Schneider, 2017; Ryan et al., 2013; Schroyen et al., 2016). Clinical vignettes begin by describing the healthcare setting and then go on to present the patient's case. Following the patient's case are assumptions about the vignette that are relevant to the outcome measures.

There were a total of four conditions for the vignettes. There were three conditions with a specified age of "20" or "42" or "74" years. The control condition did not mention any age in the clinical vignette. The Qualtrics randomizer feature was used to assign participants into one of four conditions randomly. The vignette was followed by four questions aimed at assessing their recommendations in terms of: a) the frequency of physical activity; b) the duration of physical activity; c) the level of intensity of physical activity; and d) endorsed support for physical activity for the patient (Appendix A). Following the vignette questions, participants were asked about their personal levels of physical activity (e.g., frequency, duration, and intensity). On the next page, participants completed questions on their future career goals in applied or clinical

practice as well as their previous education and experience with younger and older adults. Next, participants were asked to complete the Relating to Older People Evaluation (ROPE) and the Ambivalent Ageism Scale (AAS), which are validated and reliable assessment tools used to measure aging attitudes (Cary, Chasteen, & Remedios, 2017; Cherry & Palmore, 2008) (Appendix A). On the last page of the survey, participants were thanked for their time, and they were assigned their credit on the participant pool system. The measures used in the study design above are further described in the section below.

Data Collection

Physical activity recommendations. Physical activity recommendation measurements were based on the Canadian Physical Activity Guidelines developed by the CSEP (Tremblay et al., 2011). The CSEP physical activity recommendations provide information regarding weekly frequency, duration, and intensity of physical activity. Physical activity recommendations were measured through frequency (e.g., number of days per week), duration (e.g., minutes per session), and intensity (e.g. level of exertion during physical activity session). Responses for physical activity frequency were measured on an 8-point scale ranging from '0 days per week' to '7 days per week.' Physical activity duration was measured on a 10-point scale ranging from 'Approximately 0 minutes per session' to 'Approximately 90 minutes per session'; each response level increased by 10 minutes. Physical activity intensity was measured on an eight-point scale ranging from 'No exertion' to 'Maximum intensity levels of activity.' Participants were provided with a brief explanation for each level of intensity. Participants were also asked to explain their rationale for the physical activity recommendation, which was reported through an open-ended question.

Support for physical activity recommendations. Participants were asked about their level of support for the physical activity intervention they recommended. Support for physical activity intervention was measured on a 10-point scale, ranging from zero referring to 'No support" to 10 referring to 'Full support.' This measure was included to understand if there were any differences in the level of support for the physical activity intervention between groups.

Relating to older people evaluation. The Relating to Older People Evaluation (ROPE) is a self-report questionnaire that measures the frequency and types of ageist behaviours in daily life (Cherry & Palmore, 2008). This questionnaire was designed to measure ageism at the personal level (behaviours), not institutional or societal ageism. This measure was included to understand how the prevalence of ageist behaviours at a personal level influence physical activity recommendations for different age groups. The ROPE measure was developed among college students, community-dwelling older adults, and university community members. The self-report questionnaire measures the frequency and types of ageist behaviours. Six of the items represent positive types of ageism, and 14 represent negative types. There are three response categories for each item: Never (0), Sometimes (1), and Often (2). Negative ($r = 0.57$) and positive ($r = 0.72$) ageism items had significant test-retest reliability scores for a two-week and eight-week delay of testing (Cherry & Palmore, 2008). Internal consistency reliability was tested using Cronbach's alpha (0.70). Refer to Appendix A for a complete list of the 20-item questionnaire.

Ambivalent ageism scale. The Ambivalent Ageism Scale (AAS) is a 13-item measure developed to measure traits of hostile and benevolent ageism (Cary et al., 2017). Hostile ageism is prejudice or discrimination as a result of an individual's age. Individuals with this trait are more likely to treat older adults in an explicit negative manner. Over-accommodating and

patronizing behaviours characterize benevolent ageism. For example, insisting that an older adult take a seat that you have offered on the bus even after they have refused. Although offering a seat is a positive behaviour, insisting that an older individual take the seat undermines their ability to make decisions. Benevolent ageism is relevant to physical activity recommendations for older adults because healthcare providers may view physical activity as a dangerous activity for older adults, which can lead to under-treatment. This form of benevolent ageism can lead to a loss of self-esteem, motivation, confidence, and feelings of control among older adults (Cary et al., 2017).

The AAS was developed among young and middle-aged participants in North America. The scale consists of 13 items, nine benevolent items, and four hostile items. All of the responses use a seven-point response scale (1 = "Strongly Disagree", 7 = "Strongly Agree"). Two scores were calculated based on the sum of responses for each subscale (e.g., hostile ageism and benevolent ageism) of the AAS. The AAS demonstrated construct validity as evidenced by high correlation with the Fraboni Scale on Ageism (FSA), $r(159) = .65$, $p < .001$. The scale also has high test-retest reliability with two weeks between the collection of overall AAS scores, $r(21) = 0.76$, $p < .001$. Refer to Appendix A for a complete list of the 13-item measure.

Demographic variables. Demographic variables include program of study ("Kinesiology and Health Science" or "Other"), degree program ("BSc", "BA", or "Other"), year of study ("1st year", "2nd year", "3rd year", "4th year", or "5th year or more"), age, gender ("Female", "Genderqueer", "Male", "Transgender", or "Other"), and ethnicity/cultural background (Refer to Appendix A for ethnicity/cultural background responses). Demographic variables were included to describe the sample and to assess randomization between the four groups. Randomization

between the four groups is successful when the proportions of sociodemographic characteristics between groups are not significantly different.

Experiences with younger and older adults. Participants were asked if they have taken any courses related to aging at York University or outside of the university ("KINE 3350 [Physical Activity, Health, and Aging]", "KINE 4645 [Active Living and Aging]", "KINE 4646 [Delivering Exercise to the Aging]", "Other", or "I have not completed any courses related to aging"). Participants were also asked if they have any experience working with older adults. Participants who answered "Yes", were then asked to specify what type of experience they have working with older adults ("Family experience", "Community experience", "Work experience", "Volunteer experience" or "Other"). Participants were also asked the same set of questions for younger adults.

Future career goals. To gauge interest in participants' interest in working as a healthcare provider, participants were asked about their future career goals. Participants were asked if they envisioned themselves becoming a healthcare provider or practitioner (yes/no) and, if so, to specify the health profession. This information provides insight into the generalizability of the findings to healthcare practice.

Personal physical activity levels. Participants were also asked about their personal physical activity levels (i.e., frequency, duration, and intensity). This set of questions used the same frequency, duration, and intensity scales from the case study vignettes. Personal physical activity levels could affect the likelihood of recommending physical activity to other people (Lobelo, Duperly, & Frank, 2009).

Data Analysis

Data were analyzed using IBM SPSS 26. Descriptive statistics were reported as counts and percentages for categorical variables and as means and standard deviations for continuous variables. Additionally, chi-square tests were conducted for all categorical covariates to ensure that randomization was completed successfully and responses to sociodemographic questions were not unequally distributed between groups. ANOVA testing was used to examine potential between-group differences (20-year-old x 42-year-old x 74-year-old x Control) in terms of the main effects on physical activity recommendations (i.e., physical activity intensity, duration, frequency, support) (the dependent measures are found in Appendix A).

Prior to conducting an ANOVA to compare means, assumptions for ANOVA and outliers were tested for each main outcome variable. Outliers were checked using the mean and standard deviation method, any values that were more than three standard deviations above or below the mean were considered outliers. The normal distribution assumption was tested through histograms, Q-Q plots, skewness, and kurtosis values. These tests were preferred over Kolmogorov-Smirnov and Shapiro-Wilk tests due to the large sample size. If the normal distribution assumption was violated, a non-parametric test was used instead (e.g., Kruskal-Wallis test). The homogeneity of variances assumption was tested by using Levene's test for equality of variances. If there were equal variances, a one-way ANOVA was used, if there were unequal variances, Welch's ANOVA was used as this analysis does not assume that the variances are equal. The between-group differences were examined further with either a Sidak or Games-Howell test. The Sidak test was used when variances were equal and the Games-Howell test was used when variances were unequal. This analysis was preferred over Dunnett T3, C, or Tamhane T2 because of its high statistical power and ability to keep experiment-wise error rate

under control when there are unequal variances (Lee & Lee, 2018). These tests were conducted for all four main outcome variables, even when the ANOVA test yielded non-significant results. Previous research has shown that the hierarchical approach of only conducting post-hoc analyses for significant ANOVA results does not always work, as there is the possibility of having significant between-group differences when there is not a significant omnibus effect (Chen, Xu, Tu, Wang, & Niu, 2018).

The potential moderating effects of participants' age, gender, ethnicity, physical activity levels, future career goals, aging attitudes, aging education, and experience with older and younger adults was also examined using two-way ANOVAs and simple main effects analyses (See Appendix A for these measures). An interaction term between the age-group condition and covariates (e.g., age-group condition X gender) was created to assess each of the potential moderating effects.

Ethical Considerations

There were no known or anticipated risks of participation; this study met the minimal risk requirements as set out in the Tri-Council Policy Statement (TCPS). Participants were asked to provide informed consent through the online survey. No identifying information was asked or recorded (including IP addresses) for the online study survey. The personal information recorded for purposes of the KURE participant pool was independent of the study survey and was not associated with or connected to the research data provided by participants. So, there was no way to connect specific participants to their data, thereby making this study anonymous to the researchers. The servers used to collect data for this online survey were based in Canada as the survey was created using Qualtrics; thus, data were not subject to the US Patriot Act. All communications to and from the Qualtrics servers were encrypted using TLS (Transport Layer

Security), and data were also encrypted. Further, the Qualtrics servers were protected by Web Application Firewalls, and Qualtrics employs an Intrusion Detection System (IDS) to monitor system access for unauthorized uses.

Demographic information (e.g., age, gender, ethnicity, program of study, etc.) that may indirectly identify participants was coded, categorized, and reported at the group level only. There were no foreseen conflicts-of-interest between the researcher and participants. This study received ethics approval from the York University Office of Research Ethics Human Participants Review Committee (HPRC) (HPRC Approval Code: e2019-362). The York University HPRC is used for research conducted by faculty and students at York University that involves human participants.

Results

Descriptive Statistics

A total of 356 participants completed the survey through the KURE system. Of these, 342 (96.1%) were Kinesiology and Health Science students. A majority of the sample was enrolled in either a BSc or BA degree program: 231 (64.9%) were enrolled in a BSc degree, 123 (34.6%) were enrolled in a BA degree, and the remaining sample was enrolled in another degree program. The sample was relatively young, with a mean age of 20.04 (*SD* = 2.83). Ninety participants (25.3%) completed the vignette with the 20-year-old, 89 participants (25.0%) completed the vignette with the 42-year-old, 89 participants (25.0%) completed the vignette with the 74-year-old, and 88 participants (24.7%) completed the vignette with no age. The sample had 216 (60.7%) females. The sample also had participants working with different age-group populations, 171 participants (48.0%) had experience working with younger adults, and 154 participants (43.3%) had experience working with older adults. The sample was also ethnically diverse: 93 (26.1%) were Caucasian, 66 (18.5%) were South Asian, 45 (12.6%) were Middle Eastern, 38 (10.7%) were Southeast Asian, and 33 (9.6%) were East Asian. A majority of the sample also identified themselves as a future healthcare professional or practitioner (n = 273, 76.7%). Chi-square results of all descriptive statistics yielded non-significant results between the four conditions, indicating that randomization across the four groups was completed successfully. Refer to Table 1 and Table 2 for all descriptive statistics.

Differences in Physical Activity Recommendations Based on Chronological Age

The purpose of this analysis was to assess if there were any differences in recommendations for physical activity between all four age group conditions. An ANOVA was the most appropriate analysis to answer this research question because the independent variable

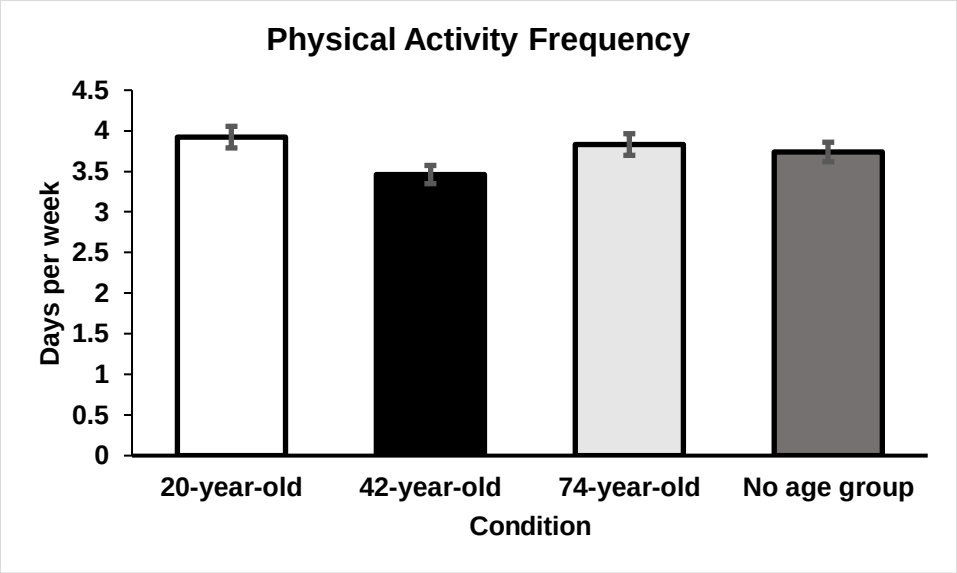
was categorical (e.g., age group conditions for clinical vignettes) and the dependent variables were continuous (e.g., scales used to measure physical activity frequency, duration, intensity, and support). Prior to conducting the ANOVA analyses for each outcome variable, outliers and assumptions of the ANOVA were tested for. Using the mean and standard deviation method to check for outliers revealed that there were no outliers for all four main outcome variables. One of the assumptions of an ANOVA test is a normal distribution of values. All four outcome variables met this assumption based on histograms, Q-Q plots, skewness, and kurtosis values. Another assumption of the ANOVA test is the homogeneity of variances. Homogeneity of variances was tested by using Levene's test for equality of variances. Levene's test revealed that there were equal variances for the physical activity frequency outcome, but all other main outcomes violated the homogeneity of variance assumption. Due to these violations in assumption, a one-way ANOVA was conducted for physical activity frequency and a Welch's ANOVA was conducted for physical activity duration, intensity, and support. Post-hoc analyses were conducted to better understand the differences between means for each main outcome variable. The Sidak test was used for physical activity frequency and a Games-Howell test was conducted for the three outcomes where variances were not equal.

Physical activity frequency. The means for physical activity frequency were 3.92 (SD = 1.27) for the 20-year-old condition, 3.46 (SD = 1.06) for the 42-year-old condition, 3.83 (SD = 1.25) for the 74-year-old condition, and 3.74 (SD = 1.13) for the no age group. The one-way ANOVA for physical activity frequency revealed no significant main effects between conditions [F (3,352) = 2.556, p = .055]. Post-hoc analyses were conducted to better understand the differences between conditions for each main outcome variable. For physical activity frequency, the Sidak test revealed no differences between all four conditions. Therefore, there were no age-

related differences in the recommendation of physical activity frequency between conditions. Refer to Table 3 for one-way ANOVA results and Table 7 for Sidak test results.

Figure 2

Physical Activity Frequency Means

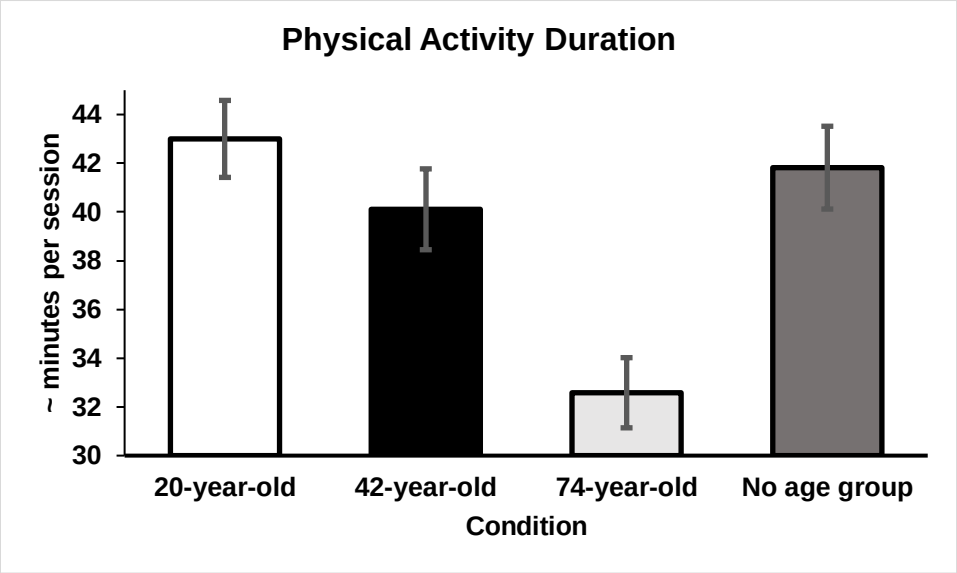


Physical activity duration. The means for physical activity duration were 4.30 (SD = 1.50) for the 20-year-old condition, 4.01 (SD = 1.56) for the 42-year-old condition, 3.26 (SD = 1.36) for the 74-year-old condition, and 4.18 (SD = 1.59) for the no age group. Welch's ANOVA for physical activity duration revealed significant main effects between conditions [F (3,352) = 8.616, $p < .001$]. The magnitude of this effect was medium [Partial $\eta^2 = .068$]. The Games-Howell test for physical activity duration indicated that there were significant mean differences between the 20-year-old [$M_{20\text{-year-old} - 74\text{-year-old}} = 1.042$, $SE = .225$, $p < .001$], 42-year-old [$M_{42\text{-year-old} - 74\text{-year-old}} = .753$, $SE = .226$, $p = .004$], and no age group [$M_{\text{No age group} - 74\text{-year-old}} = .923$, $SE = .226$, $p < .001$] conditions when compared to the 74-year-old condition. Thus, there were age-related differences in recommendations for physical activity duration, specifically decreased

levels of physical activity duration recommended for the 74-year-old patient. Refer to Table 4 for Welch's ANOVA results and Table 8 for Games-Howell test results.

Figure 3

Physical Activity Duration Means

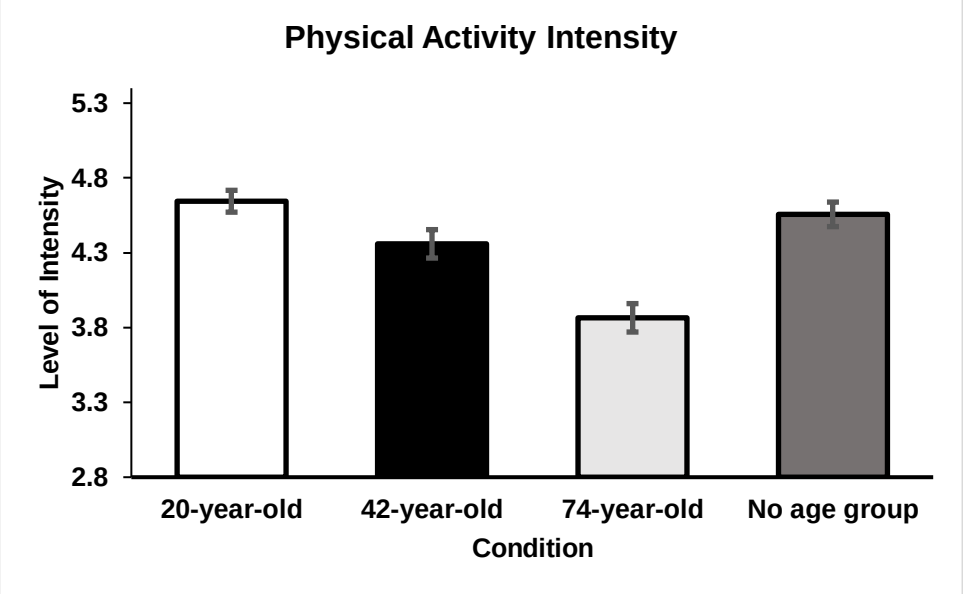


Physical activity intensity. The means for physical activity intensity were 3.64 (SD = 0.69) for the 20-year-old condition, 3.36 (SD = 0.90) for the 42-year-old condition, 2.87 (SD = 0.89) for the 74-year-old condition, and 3.56 (SD = 0.77) for the no age group. There was also a significant main effect for physical activity intensity between conditions [F (3,352) = 16.202, p < .001]. The magnitude of this effect was medium-large [Partial η^2 = .121]. Physical activity intensity also had a similar relationship between conditions; the 20-year-old [$M_{20\text{-year-old}}$ – 74-year-old = .779, SE = .122, p < .001], 42-year-old [$M_{42\text{-year-old}}$ – 74-year-old = .494, SE = .123, p = .002], and no age group [$M_{\text{No age group}}$ – 74-year-old = .692, SE = .123, p < .001] conditions had significant mean differences when compared to the 74-year-old condition. As such, there were age-related differences in recommendations for physical activity intensity, specifically decreased levels of

physical activity intensity recommended for the 74-year-old patient. Refer to Table 5 for Welch's ANOVA results and Table 8 for Games-Howell test results.

Figure 4

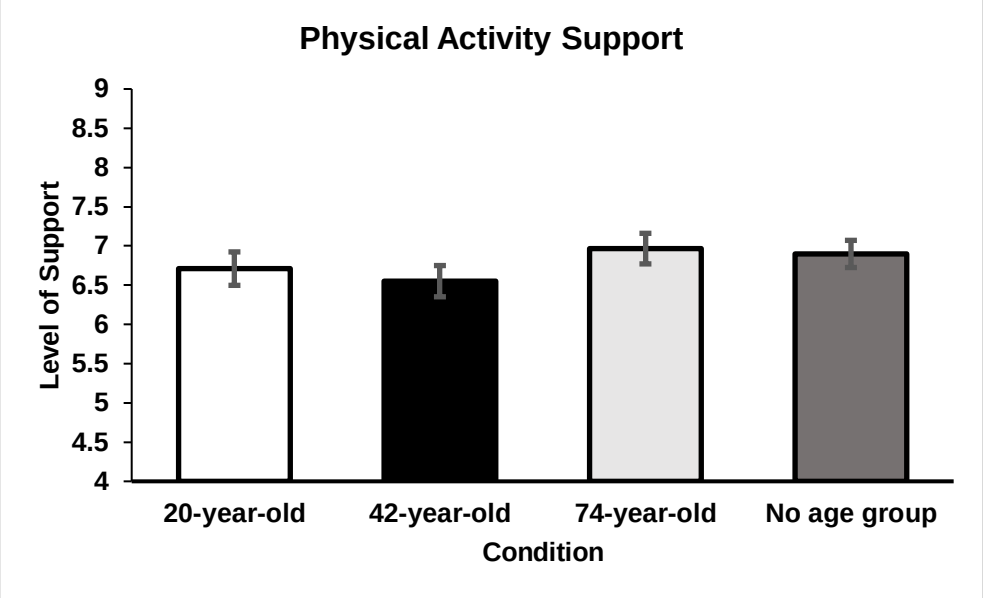
Physical Activity Intensity Means



Physical activity support. The means for physical activity support were 5.71 (SD = 2.02) for the 20-year-old condition, 5.55 (SD = 1.88) for the 42-year-old condition, 5.97 (SD = 1.84) for the 74-year-old condition, and 5.90 (SD = 1.63) for the no age group. Welch's ANOVA for physical activity support revealed no significant main effects [F (3,352) = .920, p = .431]. There were also no significant mean differences between groups for physical activity support. Therefore, there were no age-related differences in the support for physical activity intervention between conditions. Refer to Table 6 for Welch's ANOVA results and Table 8 for Games-Howell test results.

Figure 5

Physical Activity Support Means

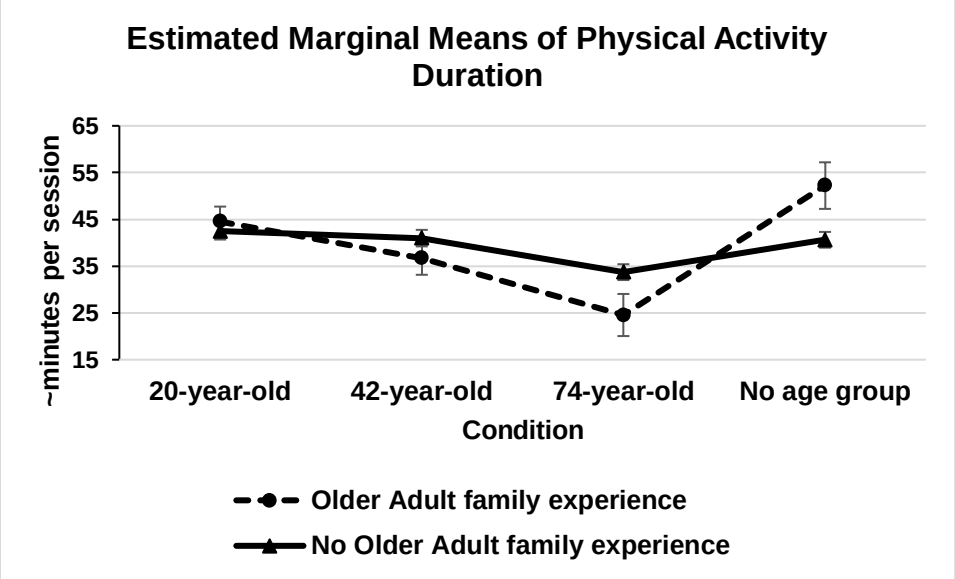


Moderating Effects

Family experience with older adults. Interaction effects were also tested to understand how sociodemographic and psychosocial variables modify the main effects for the outcome variables. For physical activity duration, there was a significant interaction effect for family experience with older adults. The two-way ANOVA revealed a significant interaction between the effects of family experience with older adults and age-group condition on physical activity duration [$F(3, 348) = 3.324$, $p = 0.020$]. This interaction effect had a small effect size [Partial $\eta^2 = .028$]. Simple main effects analysis showed that participants who had family experience with older adults recommended significantly more physical activity for the no-age group than those without family experience with older adults [$M_{OA\ Family\ experience}$ – No OA Family experience $= 1.159$, $SE = .525$, $p = .028$]. There were no other differences in family experience with older adults for other conditions. Refer to Table 9 for two-way ANOVA results.

Figure 6

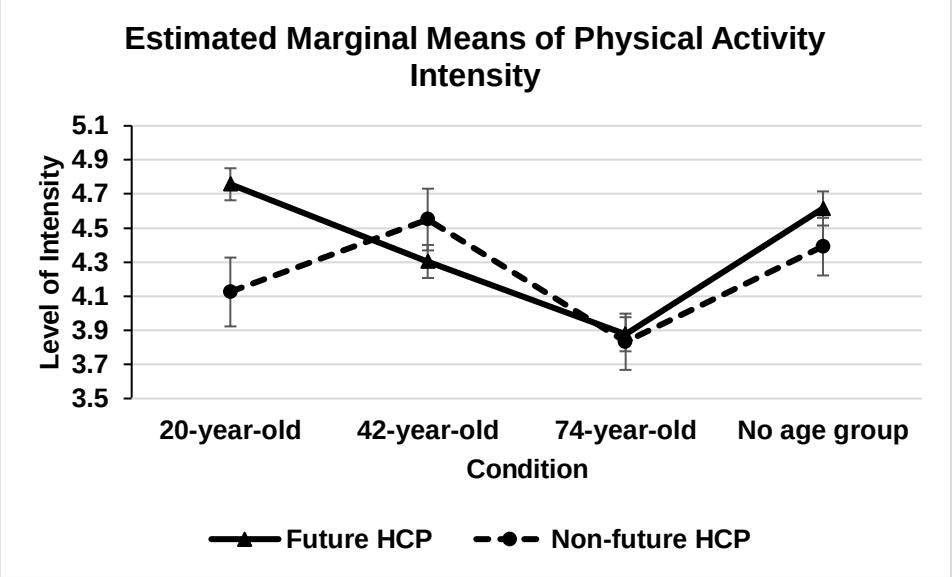
Interaction Between Older Adult Family Experience and Physical Activity Duration



Future healthcare professional. The two-way ANOVA between the effects of being a future healthcare professional and age-group condition on physical activity intensity revealed a significant interaction effect [$F(3, 348) = 2.934$, $p = 0.033$]. This interaction effect also had a small effect size [Partial $\eta_2 = .025$]. Simple main effects analysis identified that those who identified themselves as future healthcare professionals recommended significantly higher physical activity intensity for the 20-year-old group, when compared to those who do not identify themselves as future healthcare professionals [$M_{Future\ HCP - Non\text{-}Future\ HCP} = .632$, $SE = .223$, $p = .005$]. There were no other differences in future healthcare professionals for other conditions. Refer to Table 10 for two-way ANOVA results.

Figure 7

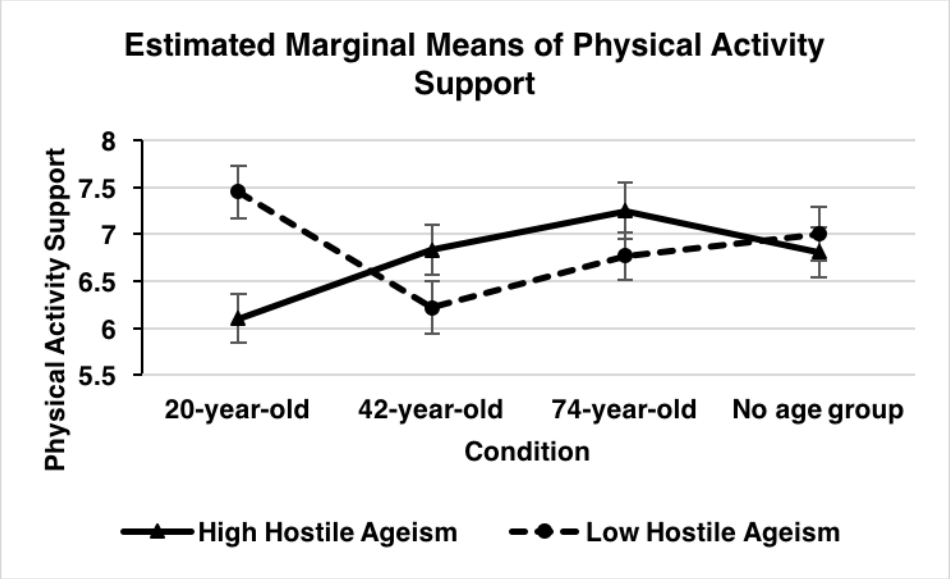
Interaction Between Future HCP and Physical Activity Intensity



Hostile ageism. The last significant interaction effect tested the effects of hostile ageism and condition on physical activity support [$F(3, 348) = 5.132$, $p = 0.002$]. This interaction effect had a small-to-moderate effect size [Partial $\eta^2 = .042$]. Simple main effects analysis revealed that those who were lower in hostile ageism had higher support for a physical activity intervention for the 20-year-old group, when compared to those who were higher in hostile ageism [$M_{\textit{Low Hostile Ageism}}$ – High Hostile Ageism = 1.301, $SE = .384$, $p = .001$]. There were no other differences in hostile ageism for other conditions. Refer to Table 11 for two-way ANOVA results.

Figure 8

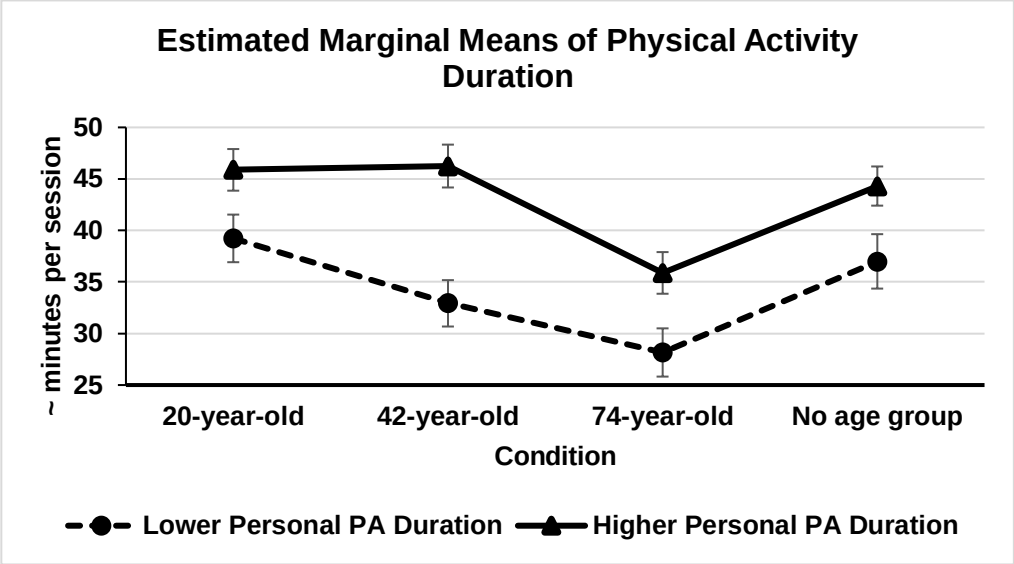
Interaction Between Hostile Ageism and Physical Activity Support



Participants' personal physical activity duration. Participants' personal physical activity duration significantly influenced physical activity recommendations across the lifespan. The two-way ANOVA for this analysis was not significant as the trends between participants who engage in high and low levels of physical activity were similar across conditions, but within conditions there is a significant difference. Physical activity duration was significantly different within the 20-year-old [$M_{\textit{High PA Duration}}$ – Low PA Duration = .665, SE = 3.07, p = .031], 42-year-old [$M_{\textit{High PA Duration}}$ – Low PA Duration = 1.332, SE = 3.07, p < .000], 74-year-old condition [$M_{\textit{High PA Duration}}$ – Low PA Duration = .772, SE = 3.09, p = .013], and no age group condition [$M_{\textit{High PA Duration}}$ – Low PA Duration = .731, SE = 3.25, p = .025]. Refer to Table 12 for two-way ANOVA results.

Figure 9

Interaction Between Personal Physical Activity Duration and Recommended Physical Activity Duration



Discussion

Overview of Findings

The two objectives of this study were to explore if there were any chronological age-related differences in the management of prediabetes via physical activity recommendations and to examine the potential moderating effects of the relationship between chronological age and physical activity recommendations. For the first research objective, the results revealed that there were age-related differences in physical activity recommendations, specifically for the duration and intensity of recommended physical activity. Both the duration and intensity of physical activity recommended were significantly lower for the 74-year-old condition when compared to the 20-year-old condition, 42-year-old condition, and no age-group condition. For physical activity duration, the mean differences ranged from 0.753 to 1.042, which is equivalent to a difference of approximately 7.53 mins to 10.42 mins per session. For physical activity intensity, the mean differences ranged from 0.494 to 0.779 on the eight-point physical activity intensity scale. The 74-year-old condition was between a ‘very light’ and ‘light’ level of intensity, whereas the other conditions were between a ‘light’ and ‘moderate’ level of intensity.

Results also revealed that there were no age-related differences in recommendations for physical activity frequency and support for physical activity intervention. For physical activity frequency, participants recommended approximately 3.74 days per week of physical activity for all four age group conditions. Participants’ average level of support for all four conditions was 5.78, which is between a ‘moderate’ and ‘full’ level of support. As such, there were relatively high levels of support for physical activity in all four age-group conditions.

On average, each of the conditions received the following physical activity recommendations:

- *20-year-old condition*: 43.0 minutes of light-to-moderate intensity physical activity for 3.92 days (168.56 minutes of physical activity per week)
- *42-year-old condition*: 40.1 minutes of light-to-moderate intensity physical activity for 3.46 days (138.75 minutes of physical activity per week)
- *74-year-old condition*: 32.6 minutes of very light-to-light intensity physical activity for 3.83 days (124.86 minutes of physical activity per week)
- *No age group condition*: 41.8 minutes of light-to-moderate intensity physical activity for 3.74 days (156.33 minutes of physical activity per week)

To answer the second research objective, significant effect modifiers were identified for participants with older adult family experience, future healthcare professionals, hostile ageism, and personal physical activity duration. Participants with older adult family experience recommended significantly higher levels of physical activity duration within the no age group condition, when compared to participants without older adult family experience. Within the no age group condition, the mean difference between participants with and without older adult family experience was approximately 1.159, which is equivalent to a difference of approximately 11.59 minutes per session.

Participants who identified themselves as future healthcare professionals recommended significantly higher levels of physical activity intensity for the 20-year-old condition when compared to participants who did not identify themselves as future healthcare professionals. Within the 20-year-old condition, there was a mean difference of 0.632 in recommended physical activity intensity between those who identified themselves as future healthcare professionals and those who did not. Participants who identified themselves as future healthcare

professionals were closer to recommending hard intensity levels, whereas participants who did not identify themselves as future healthcare professionals were closer to recommending moderate intensity levels.

Participants who were lower in hostile ageism endorsed higher levels of support for physical activity for the 20-year-old condition when compared to participants who were higher in hostile ageism. There was a mean difference of 1.301 on the 10-point scale measuring support for physical activity intervention within the 20-year-old condition between participants who were high and low in hostile ageism. Participants high in hostile ageism were closer to a moderate level of support whereas participants low in hostile ageism were closer to a full level of support.

The last significant effect modifier was observed for participants' personal physical activity duration. Across all four conditions, participants who engaged in higher levels of physical activity duration recommended higher levels of physical activity duration. The mean differences ranged from .665 to 1.332 for recommended physical activity duration, with the greatest difference in the 42-year-old condition. These mean differences are equivalent to differences of approximately 6.65 mins to 13.32 mins per session, respectively. Participants' personal physical activity duration significantly impacted all four conditions.

Age-Related Differences in Physical Activity Recommendations

Within the literature using clinical vignettes to assess age-related differences in clinical decision making, the findings are inconclusive. The current study supports the research that has identified age-related differences. Age-related differences have been identified among social work students in palliative oncology care (Kane, 2004) and nurses in oncology (Schroyen et al., 2016) in acute care settings. The studies that did not observe age-related differences in decision making were examining physical activity interventions for low back pain (Ryan et al., 2013) and

psychotherapy for symptoms of anxiety and depression (Kessler & Schneider, 2017) in community care and private practice settings, respectively. As such, the current study is one of the first studies to identify age-related differences in treatment recommendations in a community care setting. The difference in the level of prevention could contribute to this discrepancy in findings. The studies examining low back pain and symptoms of anxiety and depression would be considered tertiary prevention, as symptoms of a disease or injury have been identified in the clinical case vignettes. The current study would be considered primary prevention, as a risk factor for diabetes mellitus (prediabetes) has been identified but there is no indication of any symptoms of a disease. This finding would support research which has recognized age discrimination in primary prevention strategies (Greene & Adelman, 2003).

The current findings support research findings that older adults receive less intensive treatment for type 2 diabetes (Kokoszka & Kot, 2007). The current study also found that older adults were recommended less intensive treatment for prediabetes (precursor to type 2 diabetes) (Kokoszka & Kot, 2007). This study also supports research which has identified an association between age discrimination and diabetes mellitus (Levy et al., 2020). Overall, within the literature, age has been identified as a determinant of treatment intensity in diabetes care.

Moderating Effects

Older adult family experience. Participants who had family experience with older adults were more likely to recommend higher levels of physical activity duration when age was not a factor. Previous literature has found that people who have positive experiences working with older adults have less negative attitudes towards aging (Levy, 2016). Research has also found that caregivers' perceived benefits of physical activity influence the level of physical activity among care recipients (Kim, Ullrich-French, Bolkan, & Hill, 2018). As such,

participants' experience with physical activity among the family members they interact with can lead to higher levels of physical activity duration when there is no patient age. For example, if their experiences with family caregiving and physical activity were negative with the three age groups in this study, they may be more inclined to recommend lower levels of physical activity for these groups. Thus, when age is not a factor in the clinical vignette they may recommend higher levels of physical activity. This finding suggests that participants' perceived benefits of physical activity based on prior family caregiving experience can affect recommendations for physical activity.

Future healthcare professional. Participants who identified themselves as future healthcare professionals recommended higher levels of physical activity intensity for the younger patient. This finding would suggest that there is a heightened in-group bias among future healthcare professionals, as they recommended higher levels of physical activity for the patient that was most similar to themselves (Mean age in 20-year-old condition = 19.89, SD = 1.84). Social identity theory proposes that groups which people belong to (e.g., age, gender, race, social class, etc.) are a source of pride and self-esteem (Tajfel & Turner, 1979). Thus, group members of an in-group ("us") find negative aspects of an out-group ("them") to enhance self-image (Tajfel & Turner,1979). This in-group bias would support previous research exploring social identity theory among young adults and older adults, which has found that young adults with a strong identification with their age group distance themselves more from older adults (Chasteen, 2005). This finding would also support other literature examining in-group bias among healthcare providers for different sociodemographic factors. For example, patient and physician gender concordance has been associated with lower cardiovascular risk, better HbA1c control in diabetes treatment, and lower mortality rates following myocardial infarctions (Greenwood,

Carnahan, & Huang, 2018; Schmittdiel et al., 2009). Further, patient and physician race/ethnicity concordance is associated with more participatory decision making styles, adherence to cardiovascular disease medications, and higher ratings of patient satisfaction (Cooper et al., 2003; Cooper-Patrick et al., 1999; Traylor, Schmittdiel, Uratsu, Mangione, & Subramanian, 2010). Overall, this effect modifier supports research identifying that professional/practitioner-patient concordance leads to better health outcomes.

Hostile ageism. The younger patient had lower levels of support for physical activity when the participant had higher levels of hostile ageism. This effect modifier can be explained by ageism against youth in healthcare. Hostile ageism is a very explicit manner of prejudice or discrimination due to an individual's age. Participants who were higher in hostile ageism might stereotype younger adults as 'healthy', which could have led to decreased levels of support for a physical activity intervention. Young patients' concerns are shown to be dismissed by their healthcare providers, leading to misdiagnosis and inappropriate treatment plans (Achauer, 2010). This finding supports research that has identified ageism against youth in healthcare contexts (Achauer, 2010).

This finding can also be explained by terror management theory. Terror management theory has been used within the literature as an intergenerational root for ageism among younger adults (North & Fiske, 2012). This theory proposes that when an individual is confronted with the realization of their mortality, they dismiss potential reminders of this eventual death (Becker, 1973). When participants with very negative attitudes towards aging were confronted with a young patient (i.e., a patient similar in age to the participant) being diagnosed with prediabetes, they might try to dismiss this diagnosis, which they assume is associated with age, as an ego-protective function (North & Fiske, 2012). Participants with higher levels of hostile ageism

might show decreased levels of support for the younger patient because of the stereotypes associated with young adults and to protect their ego.

Personal physical activity duration. Personal physical activity levels of healthcare providers influence their recommendations for physical activity. The current findings suggest that participants who engage in higher levels of physical activity duration themselves recommended higher levels of physical activity duration for all four age group conditions. These findings support other research which identified that more active healthcare professionals and health professions students recommend higher levels of physical activity to their patients (Lobelo et al., 2009; Stanford, Durkin, Stallworth, & Blair, 2013).

Implications

Clinical practice. The CSEP Canadian Physical Activity Guidelines and AACE Prediabetes Management Guidelines suggest that adults should be engaging in at least 150 minutes of moderate-intensity physical activity per week. Based on the current findings, only the 20-year-old condition and no age group condition met these guidelines. The 42-year-old condition almost met these guidelines but this condition was short approximately 10 minutes of physical activity per week. The 74-year-old condition was far from meeting these guidelines as it was missing approximately 25 minutes of physical activity per week and the intensity level was only ‘very light’ to ‘light’.

The combination of low duration and low intensity physical activity that the older patient is recommended in this study would not have improved blood glucose levels for this patient. More specifically, research has identified that higher levels of physical activity intensity are more effective at managing blood glucose levels for patients with prediabetes (Hawley & Gibala, 2009). However, lower levels of physical activity intensity can still help manage blood glucose

levels if they are matched with high volume levels in terms of total energy expenditure (Hawley & Gibala, 2009). For example, having a high volume of low-intensity physical activity can still be beneficial if it has the same level of energy expenditure as a moderate volume of moderate-intensity physical activity. If there are contraindications for higher levels of physical activity intensity, low-intensity physical activity is still an option for these patients if it is matched with a higher volume. As such, healthcare providers should consider the patient's preference for physical activity intensity when making physical activity recommendations for prediabetes management.

Future research. Future research needs to examine age-related differences in other areas of healthcare. Most studies have identified age-related differences in acute care settings. More research is needed in community care and primary prevention strategies that specifically looks at chronic conditions that are preventable and disproportionately affect older adults. This research can provide insight into age-related differences for exercise recommendations in older adults with chronic conditions and guide health promotion strategies for older adults. Additionally, clinical case vignettes can also be applied to non-clinical areas such as social and employment services. Using case study vignettes in these areas can give social service professionals and employers insight into the implicit ageism that occurs in their practices.

There is also a need for more research on how aging education and experience with older adults influence clinical decision making. With the current study, it is difficult to discern what type of education or older adult experience is necessary to address implicit ageist attitudes in clinical decision making. Future studies should consider the curriculum of aging-related courses and the type and duration of experience with older adults (e.g., working with community-dwelling older adults vs. older adults in healthcare facilities, number of hours working directly

with older adults, etc.). This information can help guide effective interventions aimed at reducing implicit ageism in clinical decision making.

Strengths and Limitations

Strengths. One of the main strengths of this study was the sample size. Most studies using clinical case vignettes have between 40 and 50 participants per condition, the current study had approximately 90 participants per condition. The larger sample size allows for better representation of the population and decreases the likelihood of a type one error. Another strength of this study is the experimental design and randomization of participants. The experimental design of the current study allows for control over other variables while manipulating only the patient's age. As such, the differences in physical activity recommendations observed in the study can be attributed to chronological age.

This is also one of the first studies in the aging and clinical vignette literature to include a young adult and no age condition. Further, the addition of the 20-year-old condition gives insight into physical activity recommendations across the lifespan. This condition revealed that there may not necessarily be discrimination towards older adults, but there could be favouritism for younger patients. This was suggested by the interaction effect for future healthcare professionals and physical activity intensity recommendations. There were significantly higher levels of physical activity intensity recommended for the 20-year-old patient among future healthcare professionals. The addition of the no age condition also provides information on physical activity recommendations when age is not a factor.

Limitations. One of the limitations of this study was the limited number of participants with aging education. Within the study sample, only 17 participants had completed a course related to aging. As such, the current study was not able to examine the modifying effect of

aging education on physical activity recommendations, although aging education has been identified as a significant modifier of ageist attitudes. Experience with older adults is also another significant modifier for ageist attitudes; however, the interaction effects for this variable did not support this. This is because the present study did not collect any information on the number of hours spent working with older adults and the participants' attitudes towards their experience. Because the variable looking at experience working with older adults was asked as a 'yes' or 'no' question, participants who only had a few hours working with older adults may have also been added to the group of participants with older adult experience. Alternatively, there could have been participants with both positive and negative experiences working with older adults within this group, which could prevent a significant interaction effect for experience working with older adults. Future studies will need to examine the role of experience and education more closely.

This study used a convenience sampling method by recruiting kinesiology students from a research participant pool. This sampling method makes it difficult to generalize these findings to practicing healthcare professionals or clinicians. Additionally, these findings cannot be generalized to other areas of healthcare. These findings are specific to the management of prediabetes using physical activity. As such, it cannot be assumed that age-related differences exist in all interventions aimed at managing prediabetes or to prevent other chronic conditions using physical activity.

Additionally, the current study only used three different age groups in the clinical vignettes to assess age-related differences. Thus, the age-group polarization between these three groups is not well understood as there are approximately 20- to 30-year gaps between the age groups. Based on the current findings, it is not clear at what age we would begin to see

significant age-related differences in physical activity recommendations. These differences can begin anywhere between the 42-year-old and 74-year-old patient.

Conclusion

This study contributes to the literature examining age-related differences in clinical decision making by identifying significant differences in physical activity recommendations for prediabetes management based on chronological age alone. The experimental nature of this study allows for causal inferences between a patient's age and physical activity recommendations. Based on the recommendations made by kinesiology students, older patients do not meet the physical activity clinical practice guidelines to effectively manage prediabetes. As such, older adults that are recommended less intensive physical activity for prediabetes are more likely to progress to type 2 diabetes because of their chronological age. This study also provides insight into the modifiers of the relationship between chronological age and physical activity recommendations. Based on the current findings, encouraging healthcare professionals to engage in physical activity and addressing physician-patient discordance can reduce the age-related differences in physical activity recommendations. These age-related differences in prediabetes management must be addressed to reduce the number of cases of diabetes mellitus that can be attributed to ageism based on chronological age.

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Appendix A: Qualtrics Online Survey

1. Demographic Questions:

What program of study are you enrolled in?
- Kinesiology and Health Science
- Other (please specify):_____

Which degree program are you enrolled in?
- BSc
- BA
- Other (please specify):_____

What is your current year of study?
- 1st year
- 2nd year
- 3rd year
- 4th year
- 5th year or more

What is your current age? (please specify): _____

What is your gender?
- Female
- Genderqueer
- Male
- Transgender
- Other (please specify): _____

What is your ethnicity or cultural background? Note: A person's ethnicity describes their belonging to a group of a larger population that shares their ancestry, colour, language, or religion.
- African
- Caribbean
- Caucasian
- East Asian
- Latino or Hispanic
- Middle Eastern
- South Asian
- Southeast Asian
- West Asian
- Other (please specify): _____

2. Case Study Vignette Description:

For this case study, imagine that you are a qualified exercise professional working in a community health centre with an interdisciplinary healthcare team of a physician, a nurse, a nutritionist, and a social worker. One day, a [(randomly assigned) = *"20 year-old patient" (OR) "42 year-old patient" (OR) "74 year-old patient" (OR) "patient"*] is referred to you by one of your healthcare team members because the patient's most recent bloodwork shows that they have pre-diabetes. Your healthcare team member referred this patient to you, as a qualified exercise professional, to help them manage their blood glucose levels through aerobic physical activity.

Assume that this patient is new to exercise and has no other health conditions, diseases, or disorders, and they can be treated in an ideal setting without any barriers to receiving care. Assume that you are qualified to provide physical activity recommendations for the following questions.

DEPENDENT MEASURES

A. How many times per week would you recommend that this patient participate in physical activity?

- 0 days per week
- 1 day per week
- 2 days per week
- 3 days per week
- 4 days per week
- 5 days per week
- 6 days per week
- 7 days per week

B. How many minutes would you recommend that this patient participate in physical activity for each physical activity session noted above, if applicable?

- Approximately 0 minutes per session
- Approximately 10 minutes per session
- Approximately 20 minutes per session
- Approximately 30 minutes per session
- Approximately 40 minutes per session
- Approximately 50 minutes per session
- Approximately 60 minutes per session
- Approximately 70 minutes per session
- Approximately 80 minutes per session
- Approximately 90 minutes per session

C. Overall, at what level of intensity would you recommend this patient aim for when participating in physical activity?

0 = No exertion: The patient should be at rest and not engage in physical activity.

1 = Minimum intensity levels of activity: The patient should engage in physical activity that involves hardly any exertion, but more exertion than sitting, watching TV, etc.

2 = Very light intensity levels of activity: The patient should engage in physical activity that is very comfortable. They should move at a slow pace that they can maintain without difficulty. They should not have any difficulties with breathing or talking.

3 = Light intensity levels of activity: The patient should engage in physical activity that is comfortable. They should move at a pace that causes them to start breaking a sweat. Their breathing rate should be slightly increased, but they should not have difficulties with breathing or talking.

4 = Moderate intensity levels of activity: The patient should engage in physical activity that starts to feel slightly less comfortable. They should move at a pace that causes them to noticeably sweat. They should be slightly breathless, but they can still talk and hold a short conversation.

5 = Hard intensity levels of activity: The patient should engage in physical activity that feels slightly uncomfortable. They should move at a pace that causes them to sweat a lot. They should be short of breath. Talking is still possible and they can speak a sentence, but it is not easy.

6 = Very hard intensity levels of activity: The patient should engage in physical activity that feels uncomfortable. They should move at a pace that causes them to sweat heavily. They should be barely able to breathe and can only speak a few words at a time.

7 = Maximum intensity levels of activity: The patient should engage in physical activity that is uncomfortable. They should move at a pace that they can only maintain for a very short period of time. They should be sweating heavily, completely out of breath, and unable to talk.

D. How much support would you provide this patient for their physical activity participation?

0 = No support
1
2
3
4 = Moderate support
5
6
7
8
9 = Full Support

Please briefly explain why or how you chose the physical activity recommendations specified above:

[Open-ended response]

3. Personal Physical Activity Questions

How many times per week do you participate in physical activity?

- 0 days per week
- 1 day per week
- 2 days per week
- 3 days per week
- 4 days per week
- 5 days per week
- 6 days per week
- 7 days per week

How many minutes do you participate in physical activity for each physical activity session noted above, if applicable?

- Approximately 0 minutes per session
- Approximately 10 minutes per session
- Approximately 20 minutes per session
- Approximately 30 minutes per session
- Approximately 40 minutes per session
- Approximately 50 minutes per session
- Approximately 60 minutes per session
- Approximately 70 minutes per session
- Approximately 80 minutes per session
- Approximately 90 minutes per session

Overall, at what level of physical activity do you aim for when participating in physical activity?

0 = No exertion: The patient should be at rest and not engage in physical activity.

1 = Minimum intensity levels of activity: The patient should engage in physical activity that involves hardly any exertion, but more exertion than sitting, watching TV, etc.

2 = Very light intensity levels of activity: The patient should engage in physical activity that is very comfortable. They should move at a slow pace that they can maintain without difficulty. They should not have any difficulties with breathing or talking.

3 = Light intensity levels of activity: The patient should engage in physical activity that is comfortable. They should move at a pace that causes them to start breaking a sweat. Their

breathing rate should be slightly increased, but they should not have difficulties with breathing or talking.

4 = Moderate intensity levels of activity: The patient should engage in physical activity that starts to feel slightly less comfortable. They should move at a pace that causes them to noticeably sweat. They should be slightly breathless, but they can still talk and hold a short conversation.

5 = Hard intensity levels of activity: The patient should engage in physical activity that feels slightly uncomfortable. They should move at a pace that causes them to sweat a lot. They should be short of breath. Talking is still possible and they can speak a sentence, but it is not easy.

6 = Very hard intensity levels of activity: The patient should engage in physical activity that feels uncomfortable. They should move at a pace that causes them to sweat heavily. They should be barely able to breathe and can only speak a few words at a time.

7 = Maximum intensity levels of activity: The patient should engage in physical activity that is uncomfortable. They should move at a pace that they can only maintain for a very short period of time. They should be sweating heavily, completely out of breath, and unable to talk.

4. Future Career Goals and Previous Experience Questions

Do you envision yourself becoming a health professional or health care practitioner?
- Yes (please specify the profession or practice): _____
- No

5. Experiences with and Beliefs about Aging Questions

What courses related to aging have you completed, if any?
- KINE 3350 (Physical Activity, Health, and Aging)
- KINE 4645 (Active Living and Aging)
- KINE 4646 (Delivering Exercise to the Aging)
- Other (please specify): _____
- I have not completed any courses related to aging

Do you have any previous experience working with older adults? (check all that apply)
- Yes
  - ↳ [Skip logic]
    - What kind of experience do you have working with older adults?
    - Family experience
    - Community experience
    - Work experience
    - Volunteer experience
    - Other (please specify): _____
- No

Do you have any previous experience working with younger adults? (check all that apply)

- Yes
  - ↳ [Skip logic]
    - What kind of experience do you have working with younger adults?
    - Family experience
    - Community experience
    - Work experience
    - Volunteer experience
    - Other (please specify): _____
- No

6. ***[Note: The following questions represent the Relating to Old People Evaluation]***
Please put a check in the box that indicates how often you relate to old people (those over age 60) in these ways:

Compliment old people on how well they look, despite their age.
Never Sometimes Often

Send birthday cards to old people that joke about their age.
Never Sometimes Often

Enjoy conversations with old people because of their age.
Never Sometimes Often

Tell old people jokes about old age.
Never Sometimes Often

Hold doors open for old people because of their age.
Never Sometimes Often

Tell an old person “You’re too old for that.”
Never Sometimes Often

Offer to help an old person across the street because of their age.
Never Sometimes Often

When I find out an old person’s age, I may say, “You don’t look that old.”
Never Sometimes Often

Ask and old person for advice because of their age.
Never Sometimes Often

When an old person has an ailment, I may say, “That’s normal at your age.”
Never Sometimes Often

When an old person can’t remember something, I may say, “That’s what they call a ‘Senior Moment’”.
Never Sometimes Often

Talk louder or slower to old people because of their age.
Never Sometimes Often

Use simple words when talking to old people.
Never Sometimes Often

Ignore old people because of their age.
Never Sometimes Often

Vote for an old person because of their age.
Never Sometimes Often

Vote against an old person because of their age.
Never Sometimes Often

Avoid old people because of their age.
Never Sometimes Often

Avoid old people because they are cranky.
Never Sometimes Often

When a slow driver is in front of me, I may think, “It must be an old person.”
Never Sometimes Often

Call an old woman, “young lady,” or call an old man, “young man.”

Never Sometimes Often

7. [Note: The following questions represent the 13-item Ambivalent Ageism Scale]

Please answer the following statements on the seven-point scale provided below.

It is good to tell old people that they are too old to do certain things; otherwise they might get their feelings hurt when they eventually fail.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Even if they want to, old people shouldn’t be allowed to work because they have already paid their debt to society.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Even if they want to, old people shouldn’t be allowed to work because they are fragile and may get sick.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

It is good to speak slowly to old people because it may take them a while to understand things that are said to them.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

People should shield older adults from sad news because they are easily moved to tears.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Older people need to be protected from the harsh realities of society.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

It is helpful to repeat things to old people because they rarely understand the first time.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Even though they do not ask for help, older people should always be offered help.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Even if they do not ask for help, old people should be helped with their groceries.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Most old people interpret innocent remarks or acts as being ageist.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Old people are too easily offended.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Old people exaggerate the problems they have at work.

1	2	3	4	5	6	7

Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Old people are a drain on the health care system and the economy.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree

Appendix B: Recruitment Posting for KURE

Study Title: Physical Activity Recommendation Practices: A Case Study Approach

Researchers: Brad Meisner, PhD and Arun Eswaran, BA (Hons.)

Estimated Time of Completion: 30 minutes

Study Description: This online study explores factors associated with different physical activity recommendation practices using case studies.

What You Will Be Asked to Do: This study will require approximately 30 minutes of your time to complete an online survey. The first part of the study will consist of a few demographic questions about your age, gender, ethnicity, program of study, etc. Then you will read a very short case study description of a patient who is seeking some advice on participating in physical activity. This case study will be followed by a few questions to assess what physical activity recommendations you would provide to this patient. Following these questions, you will be asked about your future career goals, previous work experience, and your attitudes toward working with patients who represent a certain physical activity demographic.

Appendix C: Online Consent Form for Survey Participants

Informed Consent Form

Study Title: Physical Activity Recommendation Practices: A Case Study Approach

Researchers: Brad Meisner, PhD and Arun Eswaran, BA (Hons.)

Purpose of the Research: To explore factors associated with different physical activity recommendation practices using case studies.

What You Will Be Asked to Do for this Research: This study will require approximately 30 minutes of your time to complete an online survey. The first part of the study will consist of a few demographic questions about your age, gender, ethnicity, program of study, etc. Then you will read a very short case study description of a patient who is seeking some advice on participating in physical activity. This case study will be followed by a few questions to assess what physical activity recommendations you would provide to this patient. Following these questions, you will be asked about your future career goals, previous work experience, and your attitudes toward working with patients who represent a certain physical activity demographic.

Risks and Discomforts: There are no foreseen risks or discomforts for your participation in this research study.

Benefits of the Research and Benefits to You: You may benefit from participating in this research study by gaining experience with kinesiology research and you will be able to reflect on your decision making process when provinding physical activity recommendations to a future patient or client. This research will also contribute to the literature that examines physical activity recommendations provided in health and health care settings.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision to not participate will not influence the nature of your relationship with York University, either now or in the future.

Withdrawal From the Study: You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating or to refuse to answer particular questions will not affect your relationship with the researchers, York University, or any other group associated with this project. If you withdraw from the study, all associated data collected will be immediately destroyed wherever possible. Any data collected prior to closing out of the survey may still be used for analysis.

Confidentiality: All information you supply during the research will be held in strict confidence and your name will not appear in any report or publication of the research. Your data will be safely stored in a locked facility and only research staff will have access to this information. Data may possibly be used for future research by the researchers involved in the current study as anonymous secondary data. The data will be stored for five years after data collection is

complete and will be destroyed after this time period. Confidentiality will be provided to the fullest extent possible by law.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Arun Eswaran. This research has been reviewed and approved by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics.

Legal Rights:

By clicking "I agree" below, I consent to participate in this research study. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form.

- I agree
- I do not agree

Table 1. Descriptive Statistics for Categorical Variables

Measure	**Response Category**	**Total Sample (*n* = 356)**		**20-year-old condition**		**42-year-old condition**		**74-year-old condition**		**No age group**	
		n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Program of Study	Kinesiology and Health Science	342	96.1	83	92.2	87	97.8	87	97.8	85	96.6
	Other	14	3.9	7	7.8	2	2.2	2	2.2	3	3.4
Degree Program	BSc	231	64.9	50	55.6	63	70.8	61	68.5	57	64.8
	BA	123	34.6	38	42.2	26	29.2	28	31.5	31	35.2
	Other	2	.6	2	2.2	0	0	0	0	0	0
Current year of study	1st year	8	2.2	0	0	2	2.2	2	2.2	4	4.5
	2nd year	295	82.9	75	83.3	75	84.3	76	85.4	69	78.4
	3rd year	33	9.3	11	12.2	7	7.9	7	7.9	8	9.1
	4th year	13	3.7	2	2.2	2	2.2	4	4.5	5	5.7
	5th year or more	7	2.0	2	2.2	3	3.4	0	0	2	2.3
Gender	Female	216	60.7	58	64.4	53	59.6	50	56.2	55	62.5
	Male	140	39.3	32	35.6	36	40.4	39	43.8	33	37.5
Ethnicity/Cultural Background	African	20	5.6	6	6.7	4	4.5	5	5.6	5	5.7
	Caribbean	19	5.3	8	8.9	6	6.7	2	2.2	3	3.4
	Caucasian	93	26.1	21	23.3	22	24.7	24	27.0	26	29.5
	East Asian	33	9.3	8	8.9	7	7.9	9	10.1	9	10.2
	Latino or Hispanic	9	2.5	2	2.2	2	2.2	1	1.1	4	4.5
	Middle Eastern	45	12.6	10	11.1	15	16.9	12	13.5	8	9.1
	South Asian	66	18.5	14	15.6	19	21.3	15	16.9	18	20.5
	Southeast Asian	38	10.7	11	12.2	10	11.2	8	9.0	9	10.2
	West Asian	6	1.7	3	3.3	0	0	1	1.1	2	2.3
	Other	27	7.6	7	7.8	4	4.5	12	13.5	4	4.5
Condition	20 year old	90	25.3	90	100	0	0	0	0	0	0
	42 year old	89	25.0	0	0	89	100	0	0	0	0
	74 year old	89	25.0	0	0	0	0	89	100	0	0
	No age group	88	24.7	0	0	0	0	0	0	88	100
Future Healthcare Professional/ Practitioner	Yes	273	76.7	74	82.2	69	77.5	65	73.0	65	73.9
	No	83	23.3	16	17.8	20	22.5	24	27.0	23	26.1

Aging-related education	Yes	17	4.8	3	3.3	4	4.5	5	5.6	5	5.7
	No	339	95.2	87	96.7	85	9.5	84	94.4	83	94.3
Experience working with younger adults	Yes	171	48.0	41	45.6	42	47.2	44	49.4	44	50.0
	No	185	52.0	49	54.4	47	52.8	45	50.6	44	50.0
Family experience with younger adults	Yes	46	12.9	12	13.3	14	15.7	11	12.4	9	10.2
	No	310	87.1	78	86.7	75	84.3	78	87.6	79	89.8
Work experience with younger adults	Yes	107	30.1	22	24.4	24	27.0	31	34.8	30	34.1
	No	249	69.9	68	75.6	65	73.0	58	65.2	58	65.9
Volunteer experience with younger adults	Yes	115	32.3	26	28.9	33	37.1	24	27.0	32	36.4
	No	241	67.7	64	71.1	56	62.9	65	73.0	56	63.6
Experience working with older adults	Yes	154	43.3	42	46.7	40	44.9	37	41.6	35	39.8
	No	202	56.7	48	53.3	49	55.1	52	58.4	53	60.2
Family experience with older adults	Yes	60	16.9	22	24.4	18	20.2	11	12.4	9	10.2
	No	296	83.1	68	75.6	71	79.8	78	87.6	79	89.8
Work Experience with older adults	Yes	85	23.9	25	27.8	17	19.1	21	23.6	22	25.0
	No	271	76.1	65	72.2	72	80.9	68	76.4	66	75.0
Volunteer experience with older adults	Yes	81	22.8	21	23.3	21	23.6	20	22.5	19	21.6
	No	275	77.2	69	76.7	68	76.4	69	77.5	69	78.4
Age	Older	115	32.3	59	65.6	61	68.5	59	66.3	62	70.5
	Younger	241	67.7	31	34.4	28	31.5	30	33.7	26	29.5
Positive Ageism (ROPE)	Higher	181	50.8	45	50.0	41	46.1	50	56.2	45	51.1
	Lower	175	49.2	45	50.0	48	53.9	39	43.8	43	48.9
Negative Ageism (ROPE)	Higher	193	54.2	43	47.8	51	57.3	49	55.1	50	56.8
	Lower	163	45.8	47	52.2	38	42.7	40	44.9	38	43.2
Hostile Ageism (AAS)	Higher	191	53.7	42	46.7	41	46.1	52	58.4	41	46.6
	Lower	165	46.3	48	53.3	48	53.9	37	41.6	47	53.4

Benevolent Ageism (AAS)	Higher	176	49.4	48	53.3	43	48.3	55	61.8	45	51.1
	Lower	180	50.6	42	46.7	46	51.7	34	38.2	43	48.9
Personal Physical Activity Frequency	Higher	183	51.4	46	51.1	51	57.3	32	36.0	44	50.0
	Lower	173	48.6	44	48.9	38	42.7	57	64.0	44	50.0
Personal Physical Activity Duration	Higher	208	58.4	39	43.3	41	46.1	38	42.7	30	34.1
	Lower	148	41.6	51	56.7	48	53.9	51	57.3	58	65.9
Personal Physical Activity Intensity	Higher	199	55.9	38	42.2	39	43.8	34	38.2	46	52.3
	Lower	157	44.1	52	57.8	50	56.2	55	61.8	42	47.7

Table 2. Descriptive Statistics for Continuous Variables

Measure	Total Sample (*n* = 356)			20-year-old condition		42-year-old condition		74-year-old condition		No age group	
	Mean	Standard Deviation	Range	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	20.04	2.83	17 - 47	19.89	1.84	20.40	4.00	19.81	2.06	20.08	2.91
Physical Activity Frequency (days per week)	3.74	1.19	1 - 7	3.92	1.27	3.46	1.06	3.83	1.25	3.74	1.13
Physical Activity Duration	3.94	1.55	2 - 9	4.30	1.50	4.01	1.56	3.26	1.36	4.18	1.59
Physical Activity Intensity	3.36	.87	2 - 6	3.64	0.69	3.36	0.90	2.87	0.89	3.56	0.77
Physical Activity Support	5.78	1.85	2 - 9	5.71	2.02	5.55	1.88	5.97	1.84	5.90	1.63
Positive Ageism (ROPE)	5.65	2.30	0 - 11	5.91	2.7	5.76	2.32	5.42	2.00	5.51	2.07
Negative Ageism (ROPE)	5.90	3.79	0 - 24	6.51	4.29	5.56	3.40	5.66	3.85	5.84	3.54
Hostile Ageism (AAS)	12.36	4.20	4 - 23	12.56	4.36	12.82	4.00	11.52	4.33	12.53	4.07
Benevolent Ageism (AAS)	27.80	7.49	9 - 47	27.67	7.55	28.55	7.58	26.65	7.09	28.34	7.69

Table 3. One-way ANOVA for Physical Activity Frequency

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
Frequency	10.677	3	3.559	2.556	.055	.021
Error	490.028	352	1.392			

Table 4. Welch's ANOVA for Physical Activity Duration

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
Duration	58.605	3	19.535	8.616	.000	.068
Error	798.036	352	2.267			

Table 5. Welch's ANOVA for Physical Activity Intensity

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
Intensity	32.479	3	10.826	16.202	.000	.121
Error	235.215	352	.668			

Table 6. Welch's ANOVA for Physical Activity Support

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
Support	9.420	3	3.140	.920	.431	.008
Error	1201.490	352	3.413			

Table 7. Šidák Test for Physical Activity Frequency (Dependent variable with equal variances)

Dependent Variable	(I) Condition	(J) Condition	Mean Difference (I-J)	Standard Error	Significance	95% Confidence Interval	
						Lower Bound	Upper Bound
Frequency	20 year old	42 year old	.462	.176	.054	-.01	.93
		74 year old	.091	.176	.996	-.38	.56
		No age group	.184	.177	.882	-.28	.65
	42 year old	20 year old	-.462	.176	.054	-.93	.01
		74 year old	-.371	.177	.201	-.84	.10
		No age group	-.278	.177	.529	-.75	.19
	74 year old	20 year old	-.091	.176	.996	-.56	.38
		42 year old	.371	.177	.201	-.10	.84
		No age group	.093	.177	.996	-.38	.56
	No age group	20 year old	-.184	.177	.882	-.65	.28
		42 year old	.278	.177	.529	-.19	.75
		74 year old	-.093	.177	.996	-.56	.38

*Note: * The mean difference is significant at the 0.05 level.*

Table 8. Games-Howell Test for Physical Activity Duration, Intensity, and Support (Dependent variables with unequal variances)

Dependent Variable	(I) Condition	(J) Condition	Mean Difference (I-J)	Standard Error	Significance	95% Confidence Interval	
						Lower Bound	Upper Bound
Duration	20 year old	42 year old	.289	.225	.588	-.30	.88
		74 year old	1.042*	.225	.000	.49	1.60
		No age group	.118	.226	.957	-.48	.72
	42 year old	20 year old	-.289	.225	.588	-.88	.30
		74 year old	.753*	.226	.004	.18	1.32
		No age group	-.171	.226	.890	-.79	.45
	74 year old	20 year old	-1.042*	.225	.000	-1.60	-.49
		42 year old	-.753*	.226	.004	-1.32	-.18
		No age group	-.923*	.226	.000	-1.50	-.34
	No age group	20 year old	-.118	.226	.957	-.72	.48
		42 year old	.171	.226	.890	-.45	.79
		74 year old	.923*	.226	.000	.34	1.50
Intensity	20 year old	42 year old	.285	.122	.085	-.03	.60
		74 year old	.779*	.122	.000	.47	1.09
		No age group	.088	.123	.856	-.20	.37
	42 year old	20 year old	-.285	.122	.085	-.60	.03
		74 year old	.494*	.123	.002	.15	.84
		No age group	-.197	.123	.398	-.52	.13
	74 year old	20 year old	-.779*	.122	.000	-1.09	-.47

		42 year old	-.494*	.123	.002	-.84	-.15
		No age group	-.692*	.123	.000	-1.02	-.37
	No age group	20 year old	-.088	.123	.856	-.37	.20
		42 year old	.197	.123	.398	-.13	.52
		74 year old	.692*	.123	.000	.37	1.02
Support	20 year old	42 year old	.161	.276	.946	-.59	.92
		74 year old	-.255	.276	.813	-1.00	.49
		No age group	-.187	.277	.905	-.90	.53
	42 year old	20 year old	-.161	.276	.946	-.92	.59
		74 year old	-.416	.277	.445	-1.14	.31
		No age group	-.347	.278	.554	-1.03	.34
	74 year old	20 year old	.255	.276	.813	-.49	1.00
		42 year old	.416	.277	.445	-.31	1.14
		No age group	.069	.278	.994	-.61	.75
	No age group	20 year old	.187	.277	.905	-.53	.90
		42 year old	.347	.278	.554	-.34	1.03
		74 year old	-.069	.278	.994	-.75	.61

*Note: * The mean difference is significant at the 0.05 level.*

Table 9. Two-way ANOVA for Physical Activity Duration and Older Adult Family Experience

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
(Intercept)	4384.859	1	4384.859	1967.170	.000	.850
Condition	67.841	3	22.614	10.145	.000	.080
Older Adult Family Experience	.001	1	.001	.000	.987	.000
Condition x Older Adult Family Experience	22.230	3	7.410	3.324	.020	.028
Error	775.699	348	2.229			

Table 10. Two-way ANOVA for Physical Activity Intensity and Future Healthcare Professional

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
(Intercept)	4629.166	1	4629.166	7061.174	.000	.953
Condition	18.716	3	6.239	9.516	.000	.076
Future Health Professional	1.667	1	1.667	2.543	.112	.007
Condition x Future Health Professional	5.770	3	1.923	2.934	.033	.025
Error	228.142	348	.656			

Table 11. Two-way ANOVA for Physical Activity Support and Hostile Ageism

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
(Intercept)	16268.590	1	16268.590	4924.698	.000	.934
Condition	11.431	3	3.810	1.153	.328	.010
Hostile Ageism	.899	1	.899	.272	.602	.001
Condition x Hostile Ageism	50.856	3	16.952	5.132	.002	.042
Error	1149.607	348	3.303			

Table 12. Two-way ANOVA for Physical Activity Duration and Personal Physical Activity Duration

Predictor	**Sum of Squares**	***df***	**Mean Square**	***F***	***p***	**Partial η^2**
(Intercept)	8119.972	1	8119.972	3895.182	.000	.918
Condition	55.733	3	18.578	8.912	.000	.071
Personal Physical Activity Duration	65.554	1	65.554	31.447	.000	.083
Condition x Personal Physical Activity Duration	6.235	3	2.078	.997	.394	.009
Error	9538.000	348	2.085			