

# A Realist Review Protocol of Community Group-Based Programs to Promote Physical Activity in Immigrant Older Adults.

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## Protocol

**Keywords:** Immigrant, older adult, physical activity, program, realist review, intersectionality, equity

**Posted Date:** August 2nd, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-746376/v1>

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## Abstract

**Background:** Immigrants constitute 30% of Canada's older adult population. Immigrant older adults have low levels of physical activity coupled with higher risks for cardiovascular disease and obesity in some sub-populations. Community group-based physical activity programs combine both physical and social benefits and are well received by older adults. These programs often lack sensitivity to the needs of equity-deserving groups, such as immigrants, who continue to experience lower levels of participation. Local, accessible, and culturally informed approaches are required to remedy these well documented inequities in who has access to and benefits from such programs. There is a gap, however, in our understanding of the characteristics and conditions for effective program design and delivery when the target population is immigrant older adults.

**Methods:** The aim of this equity-focused realist review is to develop a programme theory that explains how, why, for whom, and under which circumstances community group-based physical activity programs work when delivered to older immigrants. We will first articulate an initial programme theory that explains tentatively how, why and for whom such programs work and then test and refine the programme theory using a systematic realist review process. The initial programme theory will draw from existing theories that inform group-based physical activity programs for older adults, intersectional theory, and stakeholder insights. PROGRESS-Plus factors will be explored in relation to relevance and impact for physical activity interventions. Stakeholders will include service providers, community volunteers and leaders who have extensive knowledge and interactions with immigrant communities. The initial programme theory will then be tested and refined using a systematic process of searching, retrieving, and reviewing literature on physical activity in immigrant populations. The final programme theory will be validated using stakeholder input and the research team's expertise in aging, health equity, and physical activity.

**Discussion:** Physical activity improves the wellbeing of older adults, decreases frailty, and supports aging in place. Ensuring that all older adults can participate in such programs entails understanding what works for whom, when and under which circumstances. This review will provide recommendations on best practices to support immigrant older adults' participation in group-based physical activity programs.

**Systematic review registration:** The protocol has been submitted to PROSPERO for registration (ID#258179, Date submitted May 30<sup>th</sup>, 2021).

## Background

Physical activity (PA) protects against and supports the management of non-communicable diseases, improves physical and mental health, and enhances overall quality of life and wellbeing [1]. Regular participation in PA and exercise preserves mobility, decreases frailty and reduces falls in older adults [2]. Despite these well-known benefits, PA levels amongst older adults remain below the recommended 150 min/week of vigorous to moderate intensity activity [3, 4]. Community group-based PA interventions, such as group walking and aerobic programs, provide opportunities for enjoyment, fostering belonging, and building friendships which can increase PA in older adults [5, 6, 7].

Canada has the second-highest percentage (21.9%) of foreign-born nationals in the world and immigrants will soon constitute 30–50% of Canada's aging population [8]. Immigrants are at a higher risk than the general population for inactivity and sedentary behavior [9, 10, 11, 12, 13]. Older immigrants, especially those who are low-income, racialized, or family-sponsored, experience significant barriers to accessing health, recreation, and social programs [14]. Lack of PA and lack of participation in PA programs in immigrants has been attributed to cultural and religious preferences, lack of social support, acculturation stressors, environmental and language barriers, perceptions of health and injury, and safety concerns [15, 16, 17, 18].

A systematic review of the literature identified 44 correlates of PA for immigrants including age, gender, religion, ethnicity, and health status [19] while another identified 183 correlates of PA and sedentary behavior [18]. Although not focused exclusively on older adults, these studies conclude that mainstream theoretical conceptualizations of PA motivators and barriers are not always relevant to immigrants and that an exploration of intersecting factors influencing PA is required to further understand how to best improve PA uptake in this population. Additionally, there has been minimal discussion in the literature on the particular ways such factors intersect to influence older immigrants' PA participation in the community [20, 21]. Despite reviews of PA programs for older adults being reported in the literature [22, 23], identified guidelines and best practices fail to address the specific needs of older immigrants. Improving PA in older immigrants entails the development of local, accessible, and culturally responsive programs that address both the physical and social needs of this population but there is limited guidance on successful evidence-based design and delivery models [24, 25, 26].

## Methods

### Aim

The aim of this realist review is to develop a programme theory that explains how, why, for whom, and under which circumstances group-based PA programs work when delivered to older immigrants. For the purposes of this review, we define older adults as individuals who are 55 years of age or older, while an immigrant is an individual born in a country other than their current country of residence. Group-based PA programs are any programs that target PA, are located within a community setting and are delivered in an in-person group environment. The key questions for this review are:

- How, why, for whom, and under which circumstances do group-based PA programs work when delivered to older immigrants?
- How do PROGRESS-Plus factors interact to influence variations in participation and effectiveness of these programs?
- What types of recommendations can ensure equitable opportunities and outcomes for older immigrants participating in these programs?

### Theoretical Lens

Equity-deserving populations are less likely to participate and benefit from health-promoting interventions which further exacerbates pre-existing inequities [27]. An intersectional lens will be utilized to sensitize the team to the roles of intersecting identities and social locations in the uptake and effectiveness of PA

programs. Intersectionality posits that social constructions such as race, gender, disability, and age create interacting and interdependent systems of oppression [28, 29]. Structural inequities are thus sustained, and, for older immigrants, are reflected in limited access to health-promoting resources [14, 30]. PROGRESS-Plus factors are used to evaluate inequities within and across interventions and include **Place of residence**, **Race**, **Occupation**, **Gender**, **Religion**, **Education**, **Socioeconomic status**, and **Social capital** in addition to **Plus** factors such as personal and group characteristics [31]. Not all of these factors are relevant for every intervention but, rather, these factors differ in importance based on the type and context of the intervention. We identified, based on key literature [18, 32], factors that shape PA in immigrants and aligned these factors to the PROGRESS-Plus list: **Place of residence** (ethnocultural density, rural/urban region, availability and appropriateness of PA facilities), **Race/culture/language** (migration status, time since migration, discrimination, language), **Gender** (gender norms, gender expectations, gender roles), **Religion** (PA beliefs & attitudes), **Education** (PA literacy, years of education), **Socioeconomic status** (financial resources for engaging in PA), **Social capital** (social support, social norms, & social environment influencing PA), and **Plus factors**: health (access to healthcare, health care system adaptation, health status), motivation, age. Only **Occupation** did not seem to be immediately relevant to PA programming for older adults but would be relevant to overall levels and types of PA [19]. An intersectional approach using these factors will be integrated into all phases of the realist review to ensure an equity lens informs recommendations on PA program design [33].

## Ethical Considerations

This review will not require ethics approval by the University of Alberta because all documents are in the public domain. The protocol has been submitted to PROSPERO for registration (ID#258179, Date submitted May 30<sup>th</sup>, 2021).

## Study Design

A realist review is an approach to synthesis that aims to explain why an intervention works or does not work in particular circumstances, by asking what works for whom, in what context, and how [34]. PA programs are complex interventions in that they are contingent for success on a set of interacting personal, interpersonal, and structural factors with a range of potential outcomes [5, 23]. PA programs in the community are rarely successful at increasing PA in immigrant populations and ways to increase participation are unclear [15, 16, 17, 18]. A realist review posits that it is only possible to achieve an understanding of the social world by identifying underlying causal mechanisms and their functions under different conditions [35]. Hence, this realist review will generate hypotheses in the form of “programme theories” or “explanations of how things work” to explore the features and conditions necessary for a successful group-based PA program for immigrant older adults [36]. Central to a realist review is the identification of contexts (C), mechanisms (M), and outcomes (O) from which programme theories are developed in the form of C-M-O configurations (Table 1).

This review will follow established realist quality and publication standards (RAMSES) [38], Pawson’s realist methodology [34, 36] and PRISMA-equity reporting guidelines [33]. A PRISMA-P checklist has been completed for this protocol (Appendix A). Realist reviews have included primary data to aid with triangulating evidence with secondary sources and enhance the contextual relevance of findings [39]. Each stage will incorporate stakeholder consultations:

1. Develop an equity-focused initial programme theory (IPT) that explains tentatively how, why and for whom PA group-based programs work.
2. Test and refine the IPT for the target population of immigrant older adults using a systematic realist review process.

### 1. Developing the Initial Program Theory (IPT)

An IPT is an abstract description of how and why an intervention is assumed to work in a particular circumstance and drives the direction of empirical testing during the realist review [40]. IPTs for this study will be built from: (a) a literature search on existing theories that explain older adults’ PA uptake and adherence in group-based PA programs, (b) a theory (intersectionality) not directly related to PA but relevant to the equity lens of this study, and (c) tacit theories on what is working, how and why from stakeholder consultations [40].

#### 1.1 Searching the Literature

The literature search will examine existing theoretical evidence on group-based PA programs in older adults (Table 2). As the literature on older immigrants and PA is sparse and the theoretical development in this field minimal, we will need to expand our search to include all populations of older adults for initial theory development. Search terms of electronic databases will include combinations of: “theory, concept, framework” AND “physical activity, exercise” AND “interventions, programs” AND “older adult”. As we move through the search process and begin to identify relevant literature that can illuminate mechanistic dimensions of PA programs, we will conduct additional searches to target particular theories/concepts (see sample search strategy: Appendix B). This phase will, also, be informed by iterative one-on-one consultations with the PA theorist (JP) and practitioner (AJ) on our team.

#### 1.2 Data Extraction and Synthesizing Evidence

We will use Covidence, a systematic review management system, to facilitate the screening process which will be implemented by the two team members (JS) and (SA) with a third team member (AJ) resolving disagreements. Initial data extraction will be completed by two members of the research team (JS & SA) and followed by a detailed discussion to ensure consensus during team meetings. The team will collaboratively identify recurrent patterns of contexts and outcomes (demi-regularities) in the data and synthesize explanations (mechanisms) of these patterns [41]. The team will explore whether and how PROGRESS-Plus factors can be featured in each C-M-O statement by asking the following questions (Table 3):

- Which PROGRESS-Plus factors are taken into consideration in this paper/study?
- Are these factors looked at individually or has an intersectional lens been applied?
- What are the factors or intersections of factors that must be considered in community-based group PA programs?

### **1.3 Stakeholder Consultations**

Once the IPTs are configured, we will present the IPTs to stakeholders for review. Stakeholders will be service providers at immigrant serving agencies (Multicultural Health Brokers), seniors' organizations (SAGE; West End Seniors Activity Centre), and ethnocultural community organizations (Al-Rashid Mosque, SHAAMA Center). We will focus on stakeholders within our existing networks who are known to run PA programs in their organizations or have intimate working knowledge of the lived experiences of immigrant older adults in Alberta, Canada. We will conduct 8-10 stakeholder consultations to draw on this expertise using questions (Table 4) developed with a realist lens [36]. Consultations will be 30 minutes to one hour in length and will occur at locations convenient to participants (via telephone or zoom for the duration of COVID-19 pandemic restrictions). Notes will be taken and organized in an excel spreadsheet as they correspond to particular IPTs and will be used by the research team to refine theoretical conceptualizations.

## **2. Testing and Refining the Programme Theory**

This phase will include a systematic search, appraisal, extraction, and synthesis of evidence to test and refine the initial programme theories.

### **2.1 Searching the Literature and Appraisal**

A systematic literature search will be conducted by a team member who is a health librarian (MK) using the PRISMA-Equity Reporting Guidelines for Systematic Reviews [33]. Searches will be performed in the following electronic databases MEDLINE via OVID; EMBASE via OVID; CINAHL via EBSCOhost; Scopus via Elsevier; Cochrane Library via Wiley; Sports Medicine & Education Index via ProQuest; SPORTDiscus via EBSCOhost, in addition to grey literature and hand searches of the reference lists of papers to be synthesized in the review. We expect the following main types of studies to be included in the review: Studies that (a) describe group-based PA programs for immigrant older adults and (b) studies exploring motivators and barriers to PA in this population (Table 5). In keeping with a realist review methodology, studies will not be excluded based on design and will be selected based on their relevance; meaning their ability to address the research questions and inform the programme theories [34, 38]. The team will assess each study for final inclusion using screening criteria for relevance (Table 6) by ranking studies as conceptually rich (high), moderate or low based on their explanatory power [41]. We will automatically include conceptually high and moderate studies ranked by two independent reviewers on the team and exclude non-relevant studies. Conceptually low studies will be included based on team deliberations. Studies included in the review at this stage will be evaluated for rigor to inform the trustworthiness of final programme theories [38]. We will adopt the Mixed Methods Appraisal Tool (MMAT) which can be used for qualitative, quantitative, and mixed methods studies [43].

### **2.2 Data Extraction & Synthesizing Evidence**

Two research assistants will independently extract relevant data from included studies using an excel spreadsheet. The extracted data will consist of descriptions of interventions (type of PA program, location, population, personal/interpersonal/organizational features of the program) and findings (barriers/facilitators to adherence, outcomes of interest). Data extraction will also include PROGRESS-Plus indicators to identify ways the programme theories are shaped or altered by these factors [33]. A working session where the research assistants conduct extractions with the team will allow for agreement on the extraction process early on. In co-working sessions the team will seek evidence that adds proof or refutes aspects of the overall programme theories under investigation [44]. The team will explore the literature for the contextual (C) influences that are hypothesized to have triggered the relevant mechanism(s) (M) around PA program participation to generate the outcome(s) (O) of interest observed in older immigrants. For example, a C-M-O configuration could provide a nuanced explanation of how gender, religion, and age intersect to influence participation in PA programs and an equity-focused recommendation would be developed from this observation. A flow diagram will be used to track the flow of documents included in the review, reasons for inclusion at each stage, and key findings.

### **2.3 Final Stakeholder Consultations**

We will invite the stakeholders again to a group discussion of the final programme theory and ask for input on the usefulness and authenticity of the theory based on their experiences within immigrant communities [38]. We will record and transcribe the content of this 2-3-hour group discussion, and we will use NVivo 12 qualitative software to thematically link stakeholder input with relevant programme dimensions for final refinement.

### **2.4 Knowledge Translation Tools**

Outputs from the review will include a refined programme theory and an outline of recommendations in the form of best practices for developing group-based PA programs targeting immigrant older adults. The review methodology and resulting programme theory will be published in a peer-review journal. Recommendations will be disseminated to community stakeholders (including City of Edmonton, Multicultural Liaison Office, Seniors Clinical Network, Edmonton Seniors Coordinating Council, immigrant service agencies, ethnocultural organizations).

## **Discussion**

Maintaining independence and safety at home becomes more significant as function declines with physiological aging. One approach to addressing the lack of optimal levels of PA among older immigrants is to implement group-based PA programs that increases enjoyment and socialization. This review will guide program developers, policymakers, community organizations, and health service providers on ways to ensure programs are more equitable and meet the needs of diverse populations of older adults. To address limitations of this review, we have identified some mitigation approaches. This review is being conducted by a team of experts in the content areas of the review (aging, PA, equity research, and immigrant health). This, however, is the first time the team has come together to work on a realist review which presents a steep learning curve. The team will keep a decision-making trail throughout the process to enhance transparency and reflections on team learning. We will conduct two workshops led by our realist review expert (RF) to build team skills in conducting

realist reviews. Realist reviews can be expansive in scope and delineating the boundaries of the review is a necessary and challenging task [34]. Budget constraints and a one-year timeline will mean that we need to be selective in our scope by prioritizing for testing and refinement those programme theories identified by stakeholders as the most relevant. Additionally, middle-range theories used to inform PA interventions are expansive [45] and we will have to be selective in choosing theoretical strands that best explain the links between PROGRESS-Plus factors and outcomes of interest. Finally, our review is limited to the English language which is problematic given the focus of the study on immigrants from diverse linguistic and cultural backgrounds. There is likely some research we will miss from other contexts where the dominant language is not English. However, the team includes members fluent in Urdu (SA & SM), Mandarin (HT), and Arabic (JS) which will allow for cross-cultural and cross-linguistic iterative explorations of the literature. More importantly, many team members have strong and long-standing connections with diverse immigrant communities which brings heightened cultural sensitivity to team discussions. Overall, this realist review will provide an equity-focused understanding of PA programs and will help improve the design and delivery of such programs to older immigrants.

## Conclusion

Immigration is increasing globally as is the numbers of older adults aging in places other than their countries of birth. The health of this population is of increasing concern with adequate PA becoming a target for healthy aging. Currently, there is little understanding of successful approaches to increasing PA in older immigrants. This review will provide theoretical insights into influences and strategies for PA uptake in immigrant older adults.

## Abbreviations

**PA:** Physical activity

**PROGRESS:** Place of residence; Race/culture/language; Gender; Religion; Education; Socioeconomic status; Social capital

**C-M-O:** Contexts (C), Mechanisms (M), and Outcomes(O)

**IPT:** Initial Program Theory

## Declarations

- **Ethics approval and consent to participate:** Not required as all documents are in the public domain.
- **Consent for publication:** Not applicable
- **Availability of data and materials:** Data sharing is not applicable as there will be no primary data collection.
- **Competing interests:** The authors declare that they have no competing interests.
- **Funding:** Alberta Health Services Strategic Clinical Networks-Seniors Health-Knowledge Synthesis Grant
- **Authors' contributions:** JS, RF & SA led writing the protocol. All other team members (AJ, HT, SM, JP) provided feedback on multiple drafts of the protocol. MK completed preliminary database searches to refine search terms and inclusion/exclusion criteria. All authors read and approved the final manuscript.
- **Acknowledgements:** Not applicable

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## Tables

Table 1  
Key Definitions

|                  |                                                                                                                                       |                                                                                                                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>   | <b>Any conditions that enable or hinder the activation of a programme mechanism [37].</b>                                             | <b>For this review, context refers primarily to chosen PROGRESS-Plus factors. Example: cultural and linguistic characteristics</b>                                                                      |
| <b>Mechanism</b> | Underlying entities, processes, or social structures which operate in particular contexts to generate outcomes of interest [36].      | Example: participants will be motivated to attend the PA program to socially connect with peers who share their language and culture.                                                                   |
| <b>Outcome</b>   | The intended and unintended consequences of a program based on a context-mechanism interaction [37].                                  | Primary outcomes for this review will focus on PA level indicators. Example: increased adherence to a PA program.                                                                                       |
| <b>C-M-Oc</b>    | Context-mechanism-outcome is a configured three-way explanatory relationship that exemplifies a realist review programme theory [38]. | Example: If immigrant women are able to connect with peers who share their language and culture, they are more likely to feel safe and connected with others and, hence, will adhere to the PA program. |

Table 2  
Inclusion and Exclusion Criteria

| <b>Criteria</b>            | <b>Inclusion</b>                                                                                                                       | <b>Exclusion</b>                                                                                                                                                                                           |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Language</b>            | English                                                                                                                                | Other                                                                                                                                                                                                      |
| <b>Date</b>                | Open                                                                                                                                   | -                                                                                                                                                                                                          |
| <b>Region</b>              | Open                                                                                                                                   | -                                                                                                                                                                                                          |
| <b>Population</b>          | Older adults 55+                                                                                                                       | Other age groups                                                                                                                                                                                           |
| <b>Intervention</b>        | Group-based PA programs/interventions                                                                                                  | Social & recreation programs, rehabilitation programs, hospital programs, long-term care programs, virtual programs, home-based programs, telephone-based interventions, individual coaching interventions |
| <b>Comparison</b>          | All types of comparisons                                                                                                               |                                                                                                                                                                                                            |
| <b>Outcome</b>             | Primary outcomes including self-reported physical activity and performance-based measures such as step counts, endurance, and strength | Chronic disease management, other physical indicators not related to PA or psychosocial indicators as primary outcomes                                                                                     |
| <b>Types of Literature</b> | Primary/secondary studies that use a theoretical framework/theory,<br><br>Reviews that include theoretical frameworks/theories         | Literature that does not explicitly reference a theoretical lens, theory, or conceptual framework                                                                                                          |

Table 3  
Data Extraction and Synthesis Template

| <b>Reference</b>                                                                                                 | <b>Theory/Conceptual Framework</b> | <b>PROGRESS-Plus Factors</b>                                                                                                                                                                                                        | <b>C</b>                                                                     | <b>M</b>                                      | <b>O</b>                                         | <b>C-M-O Statement</b>                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Testing the Senior Exercise Self-efficacy Project (SESEP) for use with urban dwelling minority older adults [42] | Self-efficacy theory               | Age: 60 years and older; systolic blood pressure < 200 and diastolic blood pressure < 100,<br><br>heart rate 60–120, no known recent (within the past 6 months) history of heart attack, stroke, or<br><br>new irregular heartbeat. | Trustworthy individuals engaged in program who provides verbal encouragement | Enhance self-efficacy beliefs of participants | Enhance participants' self efficacy for exercise | If trustworthy individuals engaged in a PA based community program provide verbal encouragement to program participants their self-efficacy beliefs will be enhanced, resulting in enhanced self efficacy for exercise. |

Table 4  
 Consultation Guide using Realist Evaluation Interviewing

Please review the following descriptions of how, why and in what contexts older adults adhere and benefit from group-based PA programs.

- What outcomes can you identify in PA programs for immigrant older adults that you have been involved with?
- Do you think that these outcomes have been the same for all older immigrants in your PA program? In what ways have they been different?
- How do you think the program has caused, or helped to cause [outcome identified by respondent]?
- There are lots of ideas about how these programs actually work, and we think it probably works differently in different places and for different people. One of those ideas is [brief description of main mechanism]. Has it worked at all like that in the PA program you are involved with? Can you give an example?

Table 5  
 Inclusion and Exclusion Criteria

| Criteria            | Inclusion                                                                                                                              | Exclusion                                                                                                                                                                                                  |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Language            | English                                                                                                                                | Other                                                                                                                                                                                                      |
| Date                | Open                                                                                                                                   |                                                                                                                                                                                                            |
| Populations         | Older adults 55+ & immigrants                                                                                                          | Other age groups/non-immigrants                                                                                                                                                                            |
| Intervention        | Group-based PA programs/interventions                                                                                                  | Social & recreation programs, rehabilitation programs, hospital programs, long-term care programs, virtual programs, home-based programs, telephone-based interventions, individual coaching interventions |
| Comparison          | Any types of comparisons                                                                                                               |                                                                                                                                                                                                            |
| Outcome             | Primary outcomes including self-reported physical activity and performance-based measures such as step counts, endurance, and strength | Chronic disease management, other physical indicators not related to PA or psychosocial indicators as primary outcomes                                                                                     |
| Types of Literature | All types of reviews, primary studies, discussion papers, grey literature                                                              |                                                                                                                                                                                                            |

Table 6  
 Ranking Criteria for Study Inclusion

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Conceptually High</b>     | <p>A group-based PA program specifically designed for immigrant older adults with clear description of program/intervention and outcomes.</p> <p>OR Addresses barriers and facilitators of group-based PA program participation in immigrant older adults (micro, meso, and macro factors).</p> <p>AND includes a clear consideration of at least two PROGRESS-Plus factors with description of impact on program design and delivery (a minimum of two factors required for intersectional analysis).</p>                                                                                          |
| <b>Conceptually Moderate</b> | <p>A group-based PA program specifically designed for immigrant older adults, but the program/intervention and outcomes are not fully articulated.</p> <p>OR Addresses barriers and facilitators of any PA program (virtual, individual) for immigrant older adults.</p> <p>OR Describes other types of group-based programs (social/recreational) targeting immigrant older adults.</p> <p>AND includes a clear consideration of at least two PROGRESS-Plus factors with description of impact on program design and delivery (a minimum of two factors required for intersectional analysis).</p> |
| <b>Conceptually Low</b>      | Any study where a reference to PROGRESS-Plus factors in relation to design and delivery of PA programs is unclear but might still focus on immigrant older adults and PA.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Not Relevant</b>          | Does not include any of the above criteria: Does not reference immigrant older adults or PA or PROGRESS-Plus factors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Appendix

### Search Strategy

Embase <1974 to 2021 Jun 17>

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1  | exp exercise/ or exp muscle exercise/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 365849  |
| 2  | exp physical activity/ or exp climbing/ or exp walking/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 455880  |
| 3  | "physical activity, capacity and performance"/ or physical capacity/ or physical performance/ or training/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 123609  |
| 4  | exp sport/ or exp athletics/ or exp ball sport/ or exp combat sport/ or exp disabled sport/ or exp motor sport/ or exp racquet sport/ or exp water sport/ or exp winter sport/ or exp yoga/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 177266  |
| 5  | (physical adj3 (activ* or fitness or exercise or movement* or conditioning or exertion or training)).mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 282121  |
| 6  | (exercis* or fitness).mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 636510  |
| 7  | (aerobics or aikido or athletics or archery or badminton or ballet or bandy or barre or "base jumping" or basketball or biathlon or billiards or bobsleigh or bocce or "body building" or bouldering or boules or bowling or boxing or broomball or calisthenic* or cammag or camogie or "circuit training" or climbing or cricket or curling or cycling or dance or dances or dancing or discus or diving or fencing or football or futbol or gardening or golf or gymnastic* or handball or "hammer throw*" or "hang gliding" or "hip hop" or hockey or "horseback rid*" or hurling or javelin or jogging or judo or "jiu jitsu" or karate or kayaking or kickbox* or kiteboarding or "kung fu" or lacrosse or "lawn bowl*" or longboarding or luge or marathon* or "martial arts" or paddling or parkour or pickleball or polo or powerlifting or qigong or racewalking or "racquet ball" or raquetball or ringette or rowing or rugby or running or sailing or shinty or skate or skateboarding or skating or snooker or snorkelling or snowshoe* or soccer or sport* or swim* or "tai-kwan-do" or taekwondo or "tai chi" or telemark or tennis or tobogganing or (track adj2 field) or triathlon or "ultimate frisbee" or ultramarathon* or volleyball or walking or "weight lifting" or weightlifting or windsurfing or wrestling or wushu or yoga or sport*).mp. | 608232  |
| 8  | ((interval* or intensity) adj3 training) or HIIT or LIIT).mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12612   |
| 9  | sedentary lifestyle/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 15997   |
| 10 | laziness/ or physical inactivity/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6970    |
| 11 | (sedentary adj2 (lifestyle or behavio?r*)).mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 24164   |
| 12 | sedentariness.mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 596     |
| 13 | physical inactiv*.mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 14680   |
| 14 | or/1-13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1462721 |
| 15 | ((group* or communit*) adj4 (class* or setting* or fitness or exercise or activ* or training or intervention* or program* or participa*)) or ((fitness or exercis* or workout) adj4 class*).mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 506288  |
| 16 | 14 and 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 104395  |
| 17 | exp geriatrics/ or aged/ or aged hospital patient/ or exp elderly care/ or frail elderly/ or gerontology/ or institutionalized elderly/ or very elderly/ or ("aging in place" or elder* or geriatric* or gerodontic* or gerontol* or "old age*" or (seniors not "high school") or (older adj3 (adult* or person* or people or man or men or woman or women)) or centenarian* or nonagenarian* or octogenarian* or septuagenarian* or sexagenarian* or dottering or decrepit or tottering or overaged or "oldest old" or supercentenarian*).mp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3405476 |
| 18 | 16 and 17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 25949   |
| 19 | (theor* or framework*).ti,ab.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 964823  |
| 20 | 18 and 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 953     |

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