**Appendices**

**Appendix I: Search strategy**

OVID MEDLINE (Search conducted on March 19, 2022)

|  |  |  |
| --- | --- | --- |
| 1 | exp Middle Aged/ | 4669400 |
| 2 | exp Aged/ or exp "Aged, 80 and over"/ | 1532743 |
| 3 | ((old\* or elder\* or geriatric\*) adj5 (adult\* or patient\* or person\* or people\* or men or man or woman or women)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 888364 |
| 4 | middle aged.mp. | 4684594 |
| 5 | 1 or 2 or 3 or 4 | 5491201 |
| 6 | ((preclinical\* or pre-clinical or subclinical\* or sub-clinical or incipient\* or perceived or early) adj3 (mobility or function\* or physical) adj3 (disab\* or declin\* or limit\* or deficit\* or dysfunction\* or impair\* or difficult\* or deteriorat\* or modif\*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 2008 |
| 7 | ((preclinical\* or pre-clinical or subclinical\* or sub-clinical) adj (disab\* or declin\* or limit\* or deficit\* or dysfunction\* or impair\* or difficult\* or deteriorat\* or modif\*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 622 |
| 8 | 6 or 7 | 2592 |
| 9 | 5 and 8 | 1247 |
| 10 | limit 9 to the English language | 1191 |

**Appendix II: Data extraction instrument**

|  |  |
| --- | --- |
| **Study identifiers** | |
| Title: | |
| First Author’s last name: | Publication year: |
| Study country: | Funding: |
| **Study design** | |
| □ randomized controlled trial (RCT) □ non-randomized controlled trial (NRS)  □ controlled clinical trials □ pre-post study  □ interrupted time series study □ uncontrolled longitudinal study  □ case study □ registered trial □ protocol | |
| **Research purpose/objectives/questions** | |
|  | |
| **Participants’ characteristics (baseline)** | |
| Inclusion/exclusion criteria: | |
| Recruitment methods: | |
| settings: □ community-dwelling □ hospital discharges  □ institutional □ others: | |
| Identified as PCML: □ Yes □ No □ Not clear  If Yes, which assessment was used: | |
| Chronic condition indicated: □ Yes □ No □ Not clear  If Yes, which condition was indicated: | |
| For RCTs or NRS | |
| Sample size: | Intervention group: |
| Control/comparator group: |
| Age (Mean, SD): | Intervention group: |
| Control/comparator group: |
| Gender (F %, M %): | Intervention group: |
| Control/comparator group: |
| For pre-post or other studies | |
| Sample size: | Drop out % and reasons: |
| Age (Mean, SD): | Gender (F %, M %): |
| **Interventions** | |
| Types: □ educational □ exercise □ others: | |
| Approach: □ single-component □ multifaceted | |
| content | Intervention group: |
|  | Control/comparator group: |
| Length/Frequency/duration | Intervention group: |
|  | Control/comparator group: |
| Mode of delivery | Intervention group: |
|  | Control/comparator group: |
| Characteristics of the deliverers | Intervention group: |
|  | Control/comparator group: |
| **Outcomes** | |
| PCML outcomes reported: □ Yes □ No □ Not clear  If Yes, what outcomes were used to measure PCML changes: | |
| Other outcomes reported: □ Yes □ No □ Not clear  If Yes, what outcomes were reported: | |
| **Results** | |
|  | |
| **Conclusions** | |
|  | |
| **Strength and limitations** | |
|  | |

Reviewer’s name: Data extraction date:

**Appendix III: Preferred Reporting Items for Systematic reviews and Meta-Analyses**

**Extension for Scoping Reviews (PRISMA-ScR) Checklist**

| **SECTION** | **ITEM** | **PRISMA-ScR CHECKLIST ITEM** | **REPORTED ON PAGE #** |
| --- | --- | --- | --- |
| **TITLE** | | | |
| Title | 1 | Preclinical mobility limitation outcomes in rehabilitation interventions for middle-aged and older adults population: a scoping review | 1 |
| **ABSTRACT** | | | |
| Structured summary | 2 | Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives. | 1 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Disability is the difficulty or inability of a range of activities (Rantakokko et al., 2017; Verbrugge & Jette, 1994). It is not an inevitable aspect of aging (Jehn & Zajacova, 2019); however, the rate of disability increases as people age. (Government of Canada, 2011; Okoro et al., 2018). Similar trends are found in mobility disability, the most common type of disability experienced by older adults (Government of Canada, 2011; Okoro et al., 2018). According to the 2011 Federal Disability Report (FDR), 1 in 4 Canadians aged 65 to 74years experience mobility disability. With age, mobility disability becomes more common, affecting about 2 in 5 adults aged 75 to 84years and 3 in 5 for those aged 85 years and older (Government of Canada, 2011). In addition, midlife Canadians have been experiencing flat or increasing disability trends (Jehn & Zajacova, 2019), which is particularly problematic as these individuals represent our future older population.  Mobility refers to the ability to move oneself (independently or by using assistive devices or transportation) from one place to another (Webber et al., 2010; WHO, 2001) and to perform different activities in their environments (Siltanen et al., 2020). It is considered a prerequisite for maintaining a good quality of life and an important health outcome indicator in older adults (Siltanen et al., 2020; Abbott, 2009). Mobility disability has been associated with increased mortality risk, healthcare utilization, decreased functional independence, and quality of life (Pruitt et al., 2008; Hardy et al., 2011; Ni et al., 2017; Freiberger et al., 2020). Mobility loss with aging is commonly described as a downward trajectory with a steeper decline shown late in life (Ferrucci et al., 2016). However, age-related impairments in mobility-associated physiological systems can be compensated by changing the manner or the frequency of doing a mobility task (Ferrucci et al., 2016). Overt mobility disability only manifests when the severity of the mobility deficit becomes too high to be compensated (Ferrucci et al., 2016). The intermediary phase, occurring with progressive loss of function and preceding the onset of disability, is referred to as “preclinical disability” (Fried et al., 1991), “preclinical mobility disability” (Fried et al., 1996), or “preclinical mobility limitation” (PCML) (Mänty et al., 2007).  Preclinical disability was first conceptualized by Fried and colleagues (1991). They defined it as a functional stage where people can compensate for functional decline by modifying their task performance and thereby maintaining their function without reporting outright difficulty. Evidence showed that people reporting PCML were at an elevated risk of experiencing future overt disability in physical performance (Fried et al., 1996; Fried et al., 2001; Manty et al., 2007). Additionally, it was suggested that PCML is associated with the onset of multiple adverse health outcomes such as falls, depressed mood, and obesity in older adults (Clough-Gorr et al., 2008; Wolinsky et al., 2007; Hirvensalo et al., 2007; Mänty et al., 2010; Naugle et al., 2012). PCML is proposed as “an early warning system” for altered risk factors (Fried et al., 2000; Wolinsky et al., 2007). Individuals in this transition stage may represent an optimal group to receive interventions on prevention rather than recovery when one or multiple domains of disability is established (Clough-Gorr et al., 2008; Gregory et al., 2011; Higgins et al., 2012). In the primary prevention of disability among older adults, intervening in the PCML period may be a uniquely effective strategy to reduce the burden of disability in this population (Weiss et al., 2007). Notably, not only in non-disabled or minimally disabled people, but PCML was also found to have meaning in already-disabled older adults. For older adults experiencing overt disabilities in some tasks, identifying other tasks where preclinical modifications are reported is an effective prevention strategy (Young et al., 2010).  Though empirical findings provide sufficient evidence to move toward interventional studies targeting PCML, studies in this field have provided inconclusive results. For example, in a 12-week single-blinded RCT trial, a motor learning program was found to benefit older adults with preclinical gait dysfunction improvements in mobility performance parameters (such as gait speed and motor skill)compared to a standard treadmill walking program (Brach et al., 2013). A 12-month Quasi-experimental trial found that older adults with PCML in a physical therapy program augmented with mobile tele-health technology produced significant differences in gait speed compared to controls (Bean et al., 2019). However, other RCT studies reported little changes in impairments or functional limitations in older adults with PCML in a 24-week Tai Chi or seated flexibility exercise program(Day et al., 2012). Many factors may contribute to these conflicting findings, such as tools used to identify the stage of PCML, eligibility criteria for participants, and interventions selected. A preliminary search also showed that the outcomes measuring changes in PCML vary among studies (Day et al., 2012; Neil-Sztramko et al., 2020; Richardson et al., 2008). Some used self-reported measures, such as the preclinical disability screening tool by Fried et al. (2001) or the Preclinical mobility disability scale by Manty et al. (2007), while others debate whether performance-based measures can identify more limitations in physical function than self-report measures (Brach et al., 2013). In addition, the characteristics of the sample recruited (e.g., age, gender, cognitive level) and the variation in intervention used (e.g., type, frequency, length, intensity, and delivery professions) may also contribute to the variation in results.  Therefore, it would be productive to understand what types of interventions are used to address issues of PCML, how various outcomes are employed to measure PCML changes, and what characteristics of the participants with PCML recruited to interventional studies. To our knowledge, there is no review synthesizing PCML intervention. | 2-4 |
| Objectives | 4 | This scoping review aims to provide a comprehensive understanding of PCML intervention studies in middle-aged and older adults that have been tested or planned, map how they have been conducted and reported, identify the knowledge gaps in current literature, and make recommendations about future research direction in the interventional study in PCML. Specifically, the review questions are:  ● What types of rehabilitation interventions are used to address PCML in middle-aged and older adults?  ● What measures are used to assess PCML changes in the intervention studies? What measures are used to assess other outcomes in these intervention studies?  ● What are the characteristics of the baseline samples included in the PCML intervention studies (e.g., participants’ baseline characteristics, eligibility criteria, PCML stage assessment)? | 4-5 |
| **METHODS** | | | |
| Protocol and registration | 5 | This review is conducted and reported in accordance with the PRISMA-ScR checklist (Tricco et al., 2008) and the JBI approach developed by JBI and the JBI Collaboration (JBIC) group (Peters et al., 2020; Peters et al., 2017). The JBI approach was underpinned by the methodological frameworks initially proposed by Arksey and O’Malley (2005) and further enhanced by Levac et al. (2010). This scoping review is registered with Open Science Framework (https://osf.io/b6zr4). A detailed review protocol is posted on medRxiv (https://medrxiv.org/cgi/content/short/2022.10.22.22280644v1). | 5 |
| Eligibility criteria | 6 | Articles were eligible for inclusion in this review if they are rehabilitation interventional studies on middle-aged (45-64yrs) or older adults (65yrs or over) where PCML outcomes were reported, or if participants reported functional changes consistent with the PCML stage were intervened. Measurements of PCML stage and outcomes could be either self-reported (e.g., Fried task modification and disability scale, Manty scale, etc.) or physical performance measures (e.g., CS-PFP10, gait speed, etc.) as long as the term of PCML or synonym (e.g., preclinical disability, subclinical disability, etc.) were indicated explicitly in the studies. A rehabilitation intervention was defined as any non-surgical or non-pharmacological intervention (McGlinchey et al., 2018). We included the studies using a rehabilitation intervention as a single-component intervention or as a part of a multifaceted intervention regardless of frequency, intensity, length, and who delivered them. Because of limited evidence in this field, various study designs were considered, including randomized controlled trials (RCTs), non-randomized controlled trials (NRS), controlled clinical trials, pre-post studies, interrupted time series studies, uncontrolled longitudinal studies, case studies, registered trials, and protocols. Abstract-only publications were not considered for inclusion. Studies published other than in English were excluded due to limited resources for translation. | 5-6 |
| Information sources\* | 7 | Seven electronic databases (MEDLINE, EMBASE, AMED, PsycINFO, CINAHL, Web of Science and Cochrane CENTRAL) were selected to locate relevant intervention studies (English evidence from inception to March 19, 2022). The search strategy was generated using the PCC framework (Population, Concept, Context) and refined after consulting with a McMaster research librarian. The text words included in the titles and abstracts of relevant papers ((preclinical\* or pre-clinical or subclinical\* or sub-clinical or incipient\* or perceived or early) adj3 (mobility or function\* or physical) adj3 (disab\* or declin\* or limit\* or deficit\* or dysfunction\* or impair\* or difficult\* or deteriorat\* or modif\*)) and the index terms used to describe the papers (“middle aged” or “aged” or “aged, 80 and over”) were used to develop a complete search strategy for Ovid MEDLINE (see Appendix I). The search strategy was tailored to the specific requirements of each included database, including all identified keywords and index terms. Google Scholar was utilized to identify any other primary sources within grey literature. In addition, a hand search of the reference list of retrieved articles and review articles was conducted to identify any further studies not yet captured. A follow-up search was implemented over three months, ending on July 2, 2022, to identify any additional articles after the initial search on March 19, 2022. | 6 |
| Search | 8 | OVID MEDLINE (Search conducted on March 19, 2022)   |  |  |  | | --- | --- | --- | | 1 | exp Middle Aged/ | 4669400 | | 2 | exp Aged/ or exp "Aged, 80 and over"/ | 1532743 | | 3 | ((old\* or elder\* or geriatric\*) adj5 (adult\* or patient\* or person\* or people\* or men or man or woman or women)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 888364 | | 4 | middle aged.mp. | 4684594 | | 5 | 1 or 2 or 3 or 4 | 5491201 | | 6 | ((preclinical\* or pre-clinical or subclinical\* or sub-clinical or incipient\* or perceived or early) adj3 (mobility or function\* or physical) adj3 (disab\* or declin\* or limit\* or deficit\* or dysfunction\* or impair\* or difficult\* or deteriorat\* or modif\*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 2008 | | 7 | ((preclinical\* or pre-clinical or subclinical\* or sub-clinical) adj (disab\* or declin\* or limit\* or deficit\* or dysfunction\* or impair\* or difficult\* or deteriorat\* or modif\*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] | 622 | | 8 | 6 or 10 | 2592 | | 9 | 5 and 11 | 1247 | | 10 | limit 12 to the English language | 1191 | | Appendix I |
| Selection of sources of evidence† | 9 | Titles and abstracts of all identified citations were imported into Covidence (Veritas Health Innovation, Melbourne, Australia), and duplicated citations were removed. The first 20 citations in alphabetical order of the first author’s last name were entered into Covidence independently by two reviewers (PL and AM) to evaluate reviewer agreement and identify any revision required in the screening process. All citations deemed relevant after the title and abstract screening were included for subsequent review of the full text. Attempts were made to contact the source author for articles with missing or unclear data. Any disagreements on study selection were resolved by discussion or consensus involving a third reviewer (JR). Reviewers were not blinded to author or journal information. | 6-7 |
| Data charting process‡ | 10 | A data extraction form was developed to chart characteristics of the selected studies such as first author’s last name, publication year, types of study design, sample size, participants’ characteristics (age, gender, setting) by groups (intervention vs. comparator), and specific details about the interventions (e.g., content, length, frequency, single or multifaceted, outcomes reported) (see Appendix II). The form was reviewed, pilot-tested, and modified by the reviewers (PL, AM, JR) before full-text review process. Two reviewers (PL and AM) conducted the data extraction independently and discussed any conflicts that arose. Thirty-two studies not meeting the eligibility criteria were excluded during this stage. | 7; Appendix II |
| Data items | 11 | List and define all variables for which data were sought and any assumptions and simplifications made. | Click here to enter text. |
| Critical appraisal of individual sources of evidence§ | 12 | NA | Click here to enter text. |
| Synthesis of results | 13 | The extracted data were presented in tabular form that aligns with the research questions of this scoping review. Interventions were presented by listing type, content, length, intensity, frequency, and whether it was delivered as a single method or part of a multifaceted approach. Participants’ characteristics were presented by listing age, gender (% of female and % of male), % of participants identified as at the stage of PCML and the measurements used. Self-reported or physical performance measured PCML outcomes and other outcomes reported in the studies were also presented. A narrative summary accompanied the tabulated results and described how the results relate to the review questions. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist was also included (Appendix III). | 7-8; Appendix III |
| **RESULTS** | | | |
| Selection of sources of evidence | 14 | Using the key search descriptors, 2291 potentially relevant studies were yielded after 2061 duplicates were removed. After abstract screening and full-text reviewing, a total of 15 studies met the eligibility criteria and 14 of them were selected for this review, with one being excluded due to missing critical data. A large number of studies (n=2245) were excluded upon screening at the title and abstract stage because the key terms used in the search strategy also corresponded to other study designs (e.g. cross-sectional study) or the preclinical phase of other diseases (e.g. Alzheimer's disease, hypothyroidism). The reasons for excluding 32 studies at the stage of the full-text review were: “inappropriate patient population (n=17)”, “inappropriate study design (n=5)”, “abstract only (n=4)”, “duplicate (n=4)”, “non-English publication (n=1)”, and “missing data (n=1)”. Figure 1 illustrates a PRISMA flow diagram of study selection. | 8; Figure 1 |
| Characteristics of sources of evidence | 15 | All included studies were published from 2008 onwards, over 15 years since PCML was conceptualized by Fried and colleagues (1991). Two protocols (Ni et al., 2017 and Rantanen et al., 2019, respectively) and the respective published papers (Bean et al., 2019 and Siltanen et al., 2020, respectively) were grouped so eventualy 12 studies were reported (see Table 1 for general characteristics of the included studies). Of those, 11 were RCT trials and 1 was a Non-randomised controlled study (NRS) (quasi-experimental). Five were conducted in the United States, 3 in Canada, 2 in Finland, and 2 in Australia. Most of the included studies employed exercise as an intervention type, making up 58.3% (7/12) of trials. Other than no clear statement in 1 study, others indicated the recruitment of community-based samples. | 8-9, table 1 |
| Critical appraisal within sources of evidence | 16 | NA | Click here to enter text. |
| Results of individual sources of evidence | 17 | The findings are organized t based on the review questions of this scoping review: 1) Sample characteristics; 2) Intervention type; 3) PCML measures; 4) measures to assess other outcomes; and 5) changes in PCML outcomes | 9-14; table 2-4 |
| Synthesis of results | 18 | Same as above | Same as above |
| **DISCUSSION** | | | |
| Summary of evidence | 19 | This review examined the changes in PCML outcomes in community-dwelling older adults because of the interventions, including exercise, education, tele-physical therapy, knowledge translation, and counselling. The majority of included studies (67%, 6/9) showed the effects of the interventions by presenting improved PCML scores or a decreased proportion of participants who were identified in the PCML stage. Yet, we urge caution when interpreting this finding, given the heterogeneous nature of the sample, diverse eligibility criteria, and various PCML measures across the studies. The results may not be confirmatory until a systematic review is completed. Altogether, these findings may inform future intervention strategies to be clinically effective in disability prevention. | 14-16 |
| Limitations | 20 | Since the quality of studies was not evaluated, the potency of evidence may be influenced. As such, the findings should be interpreted cautiously | 17 |
| Conclusions | 21 | This scoping review identified 14 papers focusing on PCML interventions including: exercise, education, tele-physical therapy, knowledge translation, and counselling. The review demonstrated that there is limited published work on interventions to address PCML, especially on the middle-aged population and older adults living in other settings (other than community-dwelling). It also revealed the complexity and varieties of currently available PCML measures, which leads to the difficulty in the application of a unique measure that is valid and reliable to use and compare findings across PCML studies. This review provides preliminary evidence that rehabilitation interventions on PCML help to delay/prevent disability progression. However, since the quality of studies was not evaluated, the potency of evidence may be influenced. As such, the findings should be interpreted cautiously.  The concepts of mobility are multifactorial and complex (Freiberger et al., 2020). Correspondingly, mobility disability may result by multiple functional declines across multi-systems (Fried et al., 2001). Therefore, a multi-faceted intervention may be the most effective approach jointly make a significant beneficial impact on older adults in the PCML stage. An example of this approach is the combination of exercise and a mobility self-management (SM) program (Richardson et al., 2020). Future research should employ multifaceted interventions with different intervention components to address questions on how to maintain functional competence, prevent adverse outcomes, and reduce the burden of disability in this population.  The measurements that assess PCML need to have established sensitivity to change in this population to capture the preclinical signs of functional decline. Performance-based measures are objective, quick, inexpensive, and more reliable in assessing change over time, while self-reported measures are sensitive to early changes in function. The use of performance-based ADL/IADL assessment independent of or in conjunction with self-report as a method of identifying preclinical disability in older adults were reported in a previous study (Toto et al., 2017). By combining both, researchers can have greater specificity in detecting incident mobility difficulty than using either alone. In addition, self-report of functional limitation was also found to be associated with education (Gregory et al., 2011), culture or socio-environmental differences associated with culture (Spencer 2008), gender (Lorenz 2009), body sensation and coping practice that allowed bodily limitations to remain unnoticed or concealed limitations from others (Lorenz 2007; Lorenz 2010). Future research using self-reported measures should also consider these factors when implementing measures. | 17-18 |
| **FUNDING** | | | |
| Funding | 22 | NA | Click here to enter text. |

**Appendix IV: Studies Included in the Review**

Bean, J. F., Brown, L., Deangelis, T. R., Ellis, T., Senthil Kumar, V. S., Latham, N. K., Lawler, D., Ni, M., & Perloff, J. (2019). The rehabilitation enhancing aging through connected health prehabilitation trial. *Archives of Physical Medicine and Rehabilitation*, *100* (11), 1999–2005. https://doi.org/10.1016/j.apmr.2019.04.015

Bennett, C. G., & Hackney, M. E. (2018). Effects of line dancing on physical function and perceived limitation in older adults with self-reported mobility limitations. *Disability and rehabilitation*, *40*(11), 1259–1265. https://doi.org/10.1080/09638288.2017.1294207

Brach, J. S., Van Swearingen, J. M., Perera, S., Wert, D. M., & Studenski, S. (2013). Motor learning versus standard walking exercise in older adults with subclinical gait dysfunction: a randomized clinical trial. *Journal of the American Geriatrics Society*, *61*(11), 1879–1886. https://doi.org/10.1111/jgs.12506

Day, L., Hill, K. D., Jolley, D., Cicuttini, F., Flicker, L., & Segal, L. (2012). Impact of tai chi on impairment, functional limitation, and disability among preclinically disabled older people: a randomized controlled trial. *Archives of physical medicine and rehabilitation*, *93*(8), 1400–1407. https://doi.org/10.1016/j.apmr.2012.03.018

Day, L., Hill, K. D., Stathakis, V. Z., Flicker, L., Segal, L., Cicuttini, F., & Jolley, D. (2015). Impact of Tai-Chi on falls among preclinically disabled older people: A randomized controlled trial. *Journal of the American Medical Directors Association*, *16*(5), 420–426. https://doi.org/10.1016/j.jamda.2015.01.089

Edgren, J., Karinkanta, S., Rantanen, T., Daly, R., Kujala, U. M., Törmäkangas, T., Sievänen, H., Kannus, P., Heinonen, A., Sipilä, S., Kannas, L., Rantalainen, T., Teittinen, O., & Nikander, R. (2019). Counselling for physical activity, life-space mobility and falls prevention in old age (COSMOS): protocol of a randomised controlled trial. *BMJ Open*, *9*, 29682. https://doi.org/10.1136/bmjopen-2019-029682

Manini, T., Marko, M., VanArnam, T., Cook, S., Fernhall, B., Burke, J., & Ploutz-Snyder, L. (2007). Efficacy of resistance and task-specific exercise in older adults who modify tasks of everyday life. *The Journals of Gerontology: Series A*, *62*(6), 616–623. https://doi.org/10.1093/GERONA/62.6.616

Moore-Harrison, T. L., Speer, E. M., Johnson, F. T., & Cress, M. E. (2008). The effects of aerobic training and nutrition education on functional performance in low socioeconomic older adults. *Journal of Geriatric Physical Therapy*, *31*(1), 18–23. https://doi.org/10.1519/00139143-200831010-00004

Neil-Sztramko, S., Smith-Turchyn, J., Richardson, J., & Dobbins, M. (2020). Impact of a Knowledge Translation Intervention on Physical Activity and Mobility in Older Adults (the Move4Age Study): Randomized Controlled Trial. *Journal of medical Internet research*, *22*(2), e15125. https://doi.org/10.2196/15125

Ni, M., Brown, L. G., Lawler, D., Ellis, T. D., Deangelis, T., Latham, N. K., Perloff, J., Atlas, S. J., Percac-Lima, S., & Bean, J. F. (2017). The rehabilitation enhancing aging through connected health (REACH) study: study protocol for a quasi-experimental clinical trial. *BMC geriatrics*, *17*(1), 221. https://doi.org/10.1186/s12877-017-0618-x

Rantanen, T., Pynnönen, K., Saajanaho, M., Siltanen, S., Karavirta, L., Kokko, K., Karvonen, A., Kauppinen, M., Rantalainen, T., Rantakokko, M., Portegijs, E., & Hassandra, M. (2019). Individualized counselling for active aging: protocol of a single-blinded, randomized controlled trial among older people (the AGNES intervention study). *BMC Geriatrics*, *19*(1), 5. https://doi.org/10.1186/S12877-018-1012-Z

Richardson, J., Chan, D., Risdon, K., Giles, C., Mulveney, S., & Cripps, D. (2008). Does monitoring change in function in community-dwelling older adults alter outcome? A randomized controlled trial. *Clinical rehabilitation*, *22*(12), 1061–1070. https://doi.org/10.1177/0269215508095090

Richardson, J. (2020). Stepping-Up: Partnering With the Community to Prevent Early Mobility Decline (Stepping-Up). *ClinicalTrials.gov.* https://classic.clinicaltrials.gov/ct2/show/NCT04368949

Siltanen, S., Portegijs, E., Pynnönen, K., Hassandra, M., Rantalainen, T., Karavirta, L., Saajanaho, M. J., & Rantanen, T. (2020). Effects of an individualized active aging counseling intervention on mobility and physical activity: secondary analyses of a Randomized Controlled Trial. *Journal of Aging and Health*, *32*(10), 1316–1324. https://doi.org/10.1177/0898264320924258