Framing physical literacy for aging adults: an integrative review

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**ABSTRACT**

**Purpose:** Physical literacy is an important component for improving functional health for adults. However, little is known how physical literacy can be framed to support the rehabilitation needs of aging adults.

**Methods:** An integrative review was conducted to understand what components are used to frame physical literacy for adults. Electronic databases were searched from 2000–2021 for eligibility criteria including: 1) adults \(\geq 45\) years of age, 2) addressed physical literacy OR physical literacy components AND referred to outcomes assessing either mobility, physical function, rehabilitation, health promotion, health prevention, public health, or physical activity.

**Results:** A total of 22 articles met the inclusion criteria. The varied methodological quality, including grey literature (50%) to systematic reviews (14%), indicates that physical literacy for adults is a novel topic. When defining physical literacy for adults, 13 new constructs emerged with purposeful activities, knowledge of age-related changes and social interaction as the top three. Physical literacy interventions demonstrated improvements in self-efficacy, physical function, and exercise behaviour.

**Conclusion:** Findings from the current literature indicate that engagement in purposeful, social, and diverse activities, obtaining knowledge of age-related changes and being able to self-adapt to mobility fluctuations is the foundation to becoming a physically literate adult.

**IMPLICATIONS FOR REHABILITATION**

- Physical literacy is emerging as a promising health strategy for adults and older adults.
- Reconceptualization of the physical literacy construct to include rehabilitation approaches is needed to address the mobility challenges associated with aging.
- The foundation to becoming a physically literate adult involves monitoring one’s ability for movement and having the knowledge to identify and remediate changes in function while engaging in purposeful movements.
- Physical literacy programs for adults and older adults have potential to positively impact important health outcomes equitably for all individuals.

**Introduction**

Older adults are a rapidly growing segment of our population, accounting for 6.5 million Canadians and 17% of the population [1]. As adults age, they are at an increased risk for chronic health conditions that commonly affect function and mobility [2]. Chronic conditions such as diabetes, heart disease, stroke and cancer are the leading causes of death in Canada [3]. Currently over 33% of adults (19-64 years) and 75% of older adults (\(\geq 65\) years) report having one or more chronic condition [3]. The proportion of people with multimorbidity, defined as the co-occurrence of two or more chronic conditions, continues to rise among individuals of all ages [3,4]. Multimorbidity is a challenge for our healthcare system due to various competing demands, the complexity of treatment required, and the coordination of care needed to manage multiple health concerns. Musculoskeletal changes associated with aging such as decreased lower extremity muscle strength, impaired balance, decreased flexibility and pain can further contribute to functional impairments and mobility limitations for adults [5,6]. There is a wealth of evidence demonstrating that chronic conditions can be better managed with health promotion approaches that address risk factors such as inactivity and a sedentary lifestyle [3,7,8], however, only 11% of Canadian adults between 60 and 79 years meet the recommended physical activity guidelines of 150 min of moderate to vigorous physical activity/week [9–12]. Globally, sedentary behaviours and physical inactivity have been estimated to cost $33.8 billion annually in direct healthcare costs [13]. Additionally, individuals with multimorbid conditions represent a disproportionately high percentage of total healthcare costs (68%) for both older adults (\(>65\) years) and younger adults (\(<65\) years) [14]. To date, public health programs have demonstrated mixed outcomes with minimal uptake, usability and long-term adherence by individuals.

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with chronic conditions [15,16]. Similarly, health initiatives aimed at increasing physical activity levels for the healthy adults continue to report mixed findings [17–19]. When designing and implementing public health programs to target important functional and mobility needs of aging adults, utilizing a more rehabilitation-focused approach throughout the program planning and including education and movement components, may add value by improving important physical health outcomes [20,21].

Health promotion has been defined as “activities directed toward increasing the level of well-being and actualizing the health potential of individuals, families, communities, and societies [22].” When considering the health needs of aging adults and adults with chronic conditions, there is an integral connection between the principles of health promotion and rehabilitation. The goal of rehabilitation is to provide strategies designed to optimize functioning and reduce disability in individuals with health conditions [23]. As the underlying conditions and functional limitations will fluctuate with aging adults, health promoting behaviours can serve to optimize one’s overall health, resulting in improvement or maintenance of function. New models of healthcare involving collaborative efforts between the patient, community and healthcare system have been developed which consider the complexities involved when managing multimorbidity [24]. These models commonly involve self-management interventions with a physical activity and education component and have demonstrated improvements in patient outcomes for target populations such as self-efficacy for exercise and quality of life, along with overall decreased healthcare costs [25]. Even though there is considerable overlap between disease management interventions and health promotion programs, it is important to distinguish the two. Self-management interventions are oriented toward managing the condition(s) and symptoms with consideration to one’s overall wellness so there are fewer acute episodes. Health promotion initiatives primarily focus on overall wellness of a population with consideration to chronic condition(s) and illness [26]. A health promotion approach with an ecological focus for aging adults and adults with chronic conditions that provides access to rehabilitation information and strategies is key to changing health behaviours and improved health outcomes. If aging adults and adults with chronic conditions are to successfully engage and adhere to the evidence-based healthy aging activities and behaviours they will require a level of physical literacy. Information specific to health promotion within the context of living with age related changes and chronic conditions and delivered through population-based agencies, such as the YMCA and Heart and Stroke Foundation is a valuable resource that can allow adults to choose movement behaviours or strategies that are transferable to older age and support healthy aging. Sharing knowledge regarding the benefits of movement and exercise both in a rehabilitation and public health promotion context has potential to increase physical activity adherence for adults and older adults. Physical literacy has demonstrated positive associations with lifelong participation in movement activities, as well as self-esteem, injury reduction and social foundations [27,28].

There are varying terms used in the literature to describe physical literacy, however the most widely accepted definition is supported by the International Physical Literacy Association and explains physical literacy as “the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life” [29]. Over the last decade, physical literacy has gained popularity in industrialized countries with youth sport development, as well as primary and secondary school physical education curriculum for children. In schools, children are taught the foundations of physical literacy, through motor competencies skills and an introduction to a wide variety of movement and sport activities, with the hope to increase engagement and appreciation for a wide variety of movement activities [30]. The concept of physical literacy has relevance to adults, but the adaption of the concept to adults later in the lifespan is novel. Even though maintaining physical literacy has been identified as a critical component of healthy aging and maintaining independence [31] and researchers recognize the concept of physical literacy throughout the life-course [32], studies have predominantly focused on children and youth [33,34]. Currently, little is known about how physical literacy can be framed to support aging adults. To understand the role of physical literacy in the management of multimorbidity, we must first identify how physical literacy is defined for adults and utilized to promote healthy aging for adults and older adults. To date, there remains minimal literature discussing the intersection of physical literacy and rehabilitation. Therefore, an integrative review and thematic synthesis of the literature was used to identify what is known about physical literacy for adults and how physical literacy is currently characterized for aging adults, in the context of addressing optimal physical function and mobility. Integrative reviews provide a rigorous framework for reviewing and amalgamating literature from a variety of methodologies, including quantitative, qualitative, mixed methods, and opinion papers [35]. The aim of this paper is to address the following research questions: 1) What are the critical components included when framing physical literacy for adults and older adults? 2) What is the role of physical literacy in promoting successful aging for adults? 3) What components are important to include in a physical literacy program when considering the functional rehabilitation needs of adults and older adults? 4) How do adults and older adults currently access and use physical literacy? A systematic integrative review was chosen for the study methodology, as there is a need to synthesize the existing literature on physical literacy to understand how this construct has evolved since its inception [21]. This review has the potential to uncover constructs and principles from a variety of literature sources that can be used to evaluate if the current physical literacy definition accurately frames a physically literate adult. Currently, there are 2 systematic reviews, focusing on physical literacy constructs and definitions throughout the life-course (children and adults) and 1 scoping review examining older adult’s physical competence under the physical literacy construct. However, there are no reviews to date examining the definition of physical literacy for adults and older adults.

**Design and methods**

The following 5-step process proposed by Whittemore and Knaff was followed throughout the integrative review; problem identification, literature search, data evaluation, data analysis and presentation of findings [35].

**Literature search**

An initial search in Google Scholar, PubMed and Embase was undertaken to identify relevant search terms. Analysis of the text words contained in the titles and abstracts was conducted to determine accurate search filters. A systematic search was then conducted using the following electronic databases; Medline Ovid, CINAHL, Cochrane Library, Embase, and AMED. Google scholar was used to cross reference findings. Keywords used for
this review included ("physical literacy" OR "physical activity") AND ("adults" OR "aging") AND ("rehabilitation" OR "mobility" OR "physical functioning" OR "mobility" OR "health promotion" OR "prevention" OR "public health"). Additional papers from reference lists of the studies reviewed were identified. See Table 1 for a full list of search terms utilized.

**Inclusion and exclusion criteria**

Articles were included in this review if they met the following criteria: Included adults > 45 years AND addressed the term physical literacy OR referenced the physical literacy constructs (motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engagement in physical activities for life), AND addressed one or more outcomes/results which assessed either mobility, physical function, rehabilitation, health promotion, health prevention, public health or physical activity. On the population level, prospective studies have found that changes in physical functioning (i.e., decline in muscle strength) begin to occur among middle aged persons (i.e., 45 years) [36,37], therefore 45 years was chosen as the ideal cut off point for inclusion in the review. In addition, preclinical functional declines commonly precede mobility limitations, indicating middle age as the optimal time to intervene with physical literacy interventions. Physical literacy as a construct can be dated back to the 1800s, however only in the last 20 years has this construct re-emerged with researchers around the world. Therefore, the search dates were limited to the period of December 2000 – March 2021. Only those articles published in the English language were included. There were no restrictions based on study design. Unpublished papers, reports and documents were not excluded, as grey literature congruent with our research questions had the potential to fill the research gap, while complementing and conveying findings to a wider audience [38]. In addition, lay views of physical literacy for adults are important for testing the validity of existing models to determine whether they have relevance to the population to which they are applied [38].

**Data analysis**

Full text of all studies were independently reviewed by two investigators (CP, AM) and data extraction included documenting the following: 1) article design/methodology, 2) country of origin, 3) objective of article, 4) sample population, 5) physical literacy definition used, 6) physical literacy constructs associated with adults or older adults, 7) theoretical derivation, 8) professional association referenced 9) study results or main outcome of paper and 9) future research needed. Findings were extracted using the 4 research questions addressed by the review. Studies were then divided into quantitative, mixed methods, qualitative and opinion/literature review groupings (Supplementary Table 8). Data were organized by the principle investigator (CP) according to themes and relationships using constant comparison through qualitative indicative content analysis [40]. The extracted findings were analyzed using a systematic approach, allowing identification and categorization of findings, followed by generation of explanatory synthesis across the categorized findings. All information from the data extraction was entered into the Covidence software program, an online abstraction tool (Covidence systematic review software) [41].

**Results**

A total of 1,742 articles were identified through the initial database search and 27 additional articles were included with hand searching the reference list. After removal of duplicates, 1682 articles were screened by reading title and abstract. Full-text screening was completed with 139 articles. Many articles were excluded because the paper focused on physical activity and not physical literacy. A total of 22 articles were included in this review that addressed physical literacy and adults. The PRISMA flow diagram [42] illustrates the study selection process (Figure 1). Even though papers were included in the review from 2000–2021, the majority of articles (77%) and all systematic/scoping reviews and quantitative studies (8/8) were published between 2016 and 2021.

**Description of evidence**

The majority of papers included in the review (50%) were grey literature, including conceptual models, opinion papers and literature reviews. Five studies (23%) used quantitative methods, 2 articles (9%) included mixed methods design and 1 study (5%) used qualitative methods. There are three review papers (14%) included using a systematic methodology. Overall, with reference to the Joanna Briggs Institute Appraisal Tools [39], the methodological quality varied from low to high. Three opinion papers
were considered to have low methodological quality as they met only 3/6 of the checklist criteria. All other articles (18/22) were considered to have moderate to high methodological criteria, as they met a minimum of 5 of the assessment criteria [39]. Refer to Supplementary Tables 1–7. Papers were published in six countries however, most articles were published in Canada (45%), followed by the United States (23%) and United Kingdom (18%). This review included 2 systematic reviews [33,46], 1 scoping review [47], 2 randomized controlled studies [48,49], 1 quasi experimental study [50], 1 pre-post study [51], 1 cross-sectional survey [52], 2 mixed methods studies [53,54], 1 qualitative focus group study [55], 3 conceptual model papers [27,56,57], 6 literature review/opinion paper [28,43,44,56,58,59] and 2 grey literature education guides [28,45]. Refer to Table 2 for a description of the Literature.

Sample
Sample sizes for the 5 quantitative studies ranged from \( n = 30 \) to \( n = 725 \) with male and female participants included in all studies. The average age of the adults included in the quantitative studies is 65 years. All four intervention studies [48–51] included healthy community dwelling adults identified as physically inactive or sedentary. Qualitative and mixed methods study sample sizes ranged from \( n = 15 \) to \( n = 102 \) with an average age of 73 years.

Physical literacy definition
In total, 18/22 papers presented a definition of physical literacy. The majority of the articles (89%) refer to the current Whitehead [31] definition of physical literacy, as “the motivation, confidence, physical competence and knowledge to value and take responsibility for engagement in physical activity for life”. Both systematic reviews [33,46] and the scoping review [47] referred to the Whitehead definition when describing physical literacy for adults. The 2 randomized controlled trials [48,49] included in our review did not define physical literacy, however there was strong reference to the current physical literacy constructs, such as physical competence, motivation, knowledge, and confidence. Cairney et al. [27] present a conceptual model that moves beyond the current Whitehead definition to position physical literacy as a determinant of health. Cairney purports that “physical literacy is a multidimensional, experiential convergence of motor, affect, social and cognitive components that expand from early childhood to old age” [27]. Dudley, et al. [57] defines physical literacy as “the ability to move with confidence and competence using all the physical assets one has at their disposal at any given point in time across varying contexts”. Jones et al. [53] utilize the current Whitehead definition to present an evidence-informed conceptual model, based on health experts that expands on the current physical literacy constructs to add relevance to older adults. Papers focusing on promoting physical literacy for adults and older adults discuss the need to develop beyond the Whitehead definition to provide an inclusive representation of a physically literate adult and/or older adult.

Physical literacy constructs
From the 22 articles, 65 constructs that related to physical literacy and adults were extracted. From there, 6 components were generated from the current Whitehead definition and 13 new physical literacy components related to adults were identified. The most commonly identified new components reported in the literature consisted of meaningful/purposeful activities [18], knowledge of
Table 2. Description of the literature.

| Article Description | Citation, Year | Study/Article type | Country | Population | Social sector promoting physical literacy | Theories and frameworks referenced |
|---------------------|----------------|--------------------|---------|------------|------------------------------------------|-----------------------------------|
| Reviews             | Edwards, 2018 [46] | Systematic Review  | UK      | All ages   | Education, Sport, Community              | Phenomenological                   |
|                     | Edwards, 2017 [33] | Systematic Review  | UK      | All ages   | Education, Sport, Community              | Monist/holistic ontology, Phenomenological |
|                     | Huang, 2020 [47]   | Scoping Review     | China   | Community adults: avg age = 65–74 years | Education, Sport, Community          | Epistemology, Self-efficacy        |
|                     | Matz Costa, 2018 [48] | RCT               | US      | Inactive community older adults: avg age = 75.5 years | Education, Sport, Community          | The Social Model of Health Promotion, Trans-theoretical Model of the Stages of Change |
|                     | Stathokostas, 2017 [49] | RCT               | Canada  | Inactive community adults and older adults avg age = 70.3 years | Education, Sport, Community          | Trans-theoretical Model of the Stages of Change |
|                     | Holetter, 2019 [50] | Quasi-experimental Pilot Study | Austria  | Inactive community adults: avg age = 45 years | Community                           | Self-efficacy, Community           |
|                     | Stathokostas, 2016 [51] | Pre-post Study     | Canada  | Inactive community older adults: avg age = 70 years | Community                           | Self-efficacy                      |
|                     | Stathokostas, 2020 [52] | Cross-sectional Survey | Canada  | Community adults and older adults avg age = 70 years | Community                           | NA                               |
| Quantitative        | Monte Campelo, 2020 [55] | Qualitative Focus Groups | Canada  | Community older adults: avg age = 73.5 years | Community                           | Theory of Diffusion of Innovations Technology, Social Cognitive Theory, Self-Efficacy |
| Mixed Methods       | Jones, 2018 [53]   | Mixed Methods Consensus Study and Conceptual Model presented | Canada  | Health professionals discussing PL for community older adults, ≥65 years | Health Promotion, Public Health/Policy, Community | Behaviour Change Theory, Self-determination |
|                     | McMahon, 2019 [54] | Mixed Methods Inductive Sequential Literature Review and Conceptual Model presented | US      | Community older adults: avg age = 72 years | Health Promotion, Education, Sport, Community | Behaviour Change Theory, Self-determination |
|                     | Caine, 2019 [27]   | Literature review and Conceptual Model presented | Canada  | All ages | Education, Sport, Community              | Self-efficacy                      |
| Grey Literature     | Longmuir, 2016 [59] | Literature review  | Canada  | All ages   | Education, Sports, Community              | NA                               |
|                     | Dudley, 2017 [57]   | Literature review and conceptual model presented | Australia | All ages | Education, Public Health/Policy, Health Promotion, Sport | The four pillars of physical literacy policy |
|                     | Roetert, 2019 [60]  | Literature review and conceptual model presented | US      | Community older adults, ≥65 years | Education, Health Practitioners, PA promotion, Community | Ecological Model, Pesce’s Gross Motor Competencies, Training Selection Optimization and Compensation |
|                     | Roetert, 2018 [56]  | Opinion Paper      | US      | All ages   | Education, Health Practitioners, PA promotion, Community | NA                               |
|                     | Roetert, 2014 [58]  | Opinion paper      | US      | All ages   | Education, Health Practitioners, PA promotion, Sports | NA                               |
|                     | Higgs, 2019 [28]    | Physical Literacy information package designed for all ages | Canada  | All ages | Education, Health Practitioners, PA promotion, Community | NA                               |
|                     | Almond, 2015 [43]   | Opinion Paper      | UK      | All ages   | Education, Health Practitioners, PA promotion, Community | NA                               |
|                     | Whitehead, 2013 [44] | Opinion paper      | UK      | All ages   | Education, Health Practitioners, PA promotion, Community | NA                               |
|                     | Jones, 2016 [61]    | Commentary         | Canada  | Older Adults | Community, Sport, PA promotion, Community | NA                               |
|                     | Kitchen, 2014 [45]  | Commentary         | Canada  | Older Adults | Community, Sport, PA promotion, Community | NA                               |
age-related changes [12], social interaction [12], diverse activities [11], physical/age adaptation [10], and environmental awareness/understanding [9]. Other reported new components include positive affect/attitude [6], self-regulation [6], adequate strength, flexibility and balance [4], regular periodic movement [3], safety awareness [3], cognitive activity [3] and resilience [2]. Refer to Table 3: Physical Literacy Constructs. Following the Whitehead definition of Physical literacy, engagement in physical activity was identified in all papers (100%), followed by motivation (77%) and confidence (77%). Therefore, having the motivation and confidence to participate in physical activities, continue to be identified as key attributes to attaining physical literacy for individuals of all ages. Meaningful person-centered activities and purposeful physical activities were identified as the most commonly reported new component (86%). Making purposeful movement activities that address older adults’ pragmatic needs, such as maintaining physical and mental independence will likely increase one’s motivation for sustained movement. Knowledge of body changes related to aging was also a commonly reported component (55%) indicating the need for differing education material that address the functional and mobility needs of aging adults. Health literacy defined by The Institute of Medicine, is “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions [62]”. Aging adults living with chronic conditions are required to increase personal health decisions on a regular basis that address their fluctuating health status and manage their condition(s). The knowledge and understanding required to attain physical literacy for adults will differ to that of younger individuals. Information related to the changes with strength, flexibility, balance, speed, endurance and maintaining function as individuals age is required to keep adults informed. For example, gaining an understanding of why one is having mobility challenges or experiencing fear of falling will reinforce the need to engage in movements, despite these physiological changes. Maintaining social interactions (55%), diversity of movement (50%), environmental awareness/understanding (41%), positive affect/attitude (27%) and self-regulation skills (27%) were also commonly reported, demonstrating how physical literacy for adults can differ to that of younger individuals. The aforementioned new constructs identified, validate the need to take an ecological approach when considering the promotion of physical literacy for adults and understand how physical function can be improved, as opposed to simply promoting physical activity. Age-friendly communities with high walkability, good access to parks and recreation facilities, and sidewalk functionality should be included. Community elements such as socio-cultural norms and gender are also required to increase success.

Measuring physical literacy for adults

Of the 22 papers included, 4 articles evaluated physical literacy programs for adults and/or older adults [48–51]. Additionally, 1 systematic review [46] evaluated the measurement and assessment attempts of physical literacy for children and adults and 1 scoping review [47] explored how the physical competence of older adults’ would be measured under the concept of physical literacy. A variety of objective measures were reported such as number of steps/day, Short Physical Performance Battery Test (SPPB), 400-meter walk, and the Seniors Fitness Test. Subjective outcome measures were also reported, such as self-efficacy for exercise scale, International Physical Activity Questionnaire (IPAQ) and exercise knowledge open-ended questions. The scoping review by Huang, et al. [47] included papers that assessed physical competence under the concept of physical literacy for older adults (≥65 years). This review found that the Medical Outcomes Study Short Form–36 Questionnaire was the most common self-report measure to assess physical function. Additionally, gait speed measures [63], the senior fitness test [64] and single leg stance [65] were the most commonly reported objective measures when assessing mobility, balance and/or strength under the umbrella of physical literacy. The pilot non-randomized controlled study by Holler, et al. assessed the effects of a holistic physical exercise training on physical literacy among physically inactive adults [50]. This study was the first to measure physical literacy for community-dwelling adults by designing a questionnaire covering five identified physical literacy domains: physical activity behaviour, attitude towards a physically active lifestyle, exercise motivation, knowledge and self-efficacy. The 15-week physical literacy intervention consisted of tailored strength and endurance exercises, in addition to a multi-modal education component and as a result, significant improvements were found for the physical activity behaviour and exercise self-efficacy domains [50]. This pilot study used diverse self-report measures to assess physical literacy outcomes. Interestingly, the randomized controlled trial by Matz Costa et al. [48], evaluated their Engaged4life program, an intervention to encourage inactive adults to embed physical activities that are personally meaningful, with a variety of outcomes, including # of steps/day, # of cognitive activities/day, #social interactions/day and # of personal meaning actions/day. This intervention utilized technology monitoring, goal setting and peer mentoring to encourage physical activity, cognitive activities, social interactions and personal meaningful activities into everyday life. Improvements were found for all 4 domains for the physical literacy intervention group, however the study was not powered to detect significant differences between the self-monitoring control group. An 8-week pre-post Get Fit for Active Living (GFAL) physical literacy intervention for sedentary community dwelling older adults found significant improvements for task specific self-efficacy, lifestyle self-efficacy and physical function, as measured by SPPB [51]. Interestingly, an RCT by Statthokostas et al. [49] looked at longer term adherence levels for GFAL intervention and found improvements in exercise adherence with a 66% retention at 12 months, in addition to maintenance of the physical function outcomes at the 6 month follow up.

Physical literacy interventions for adults

Four interventions studies [48–51] were identified in the review, including 2 RCTs, 1 quasi-experimental and 1 pre-post study. Only one study measured outcomes under the concept of physical literacy and aimed to promote physical literacy for older adults [50]. The main purpose of the other 3 intervention studies were to assess adaption and adherence to physical activity after participation in a multi-component exercise program, designed with physical literacy principles. All 4 interventions targeted inactive community dwelling adults and older adults and demonstrated improvement in physical literacy outcomes. Intervention components included a range of functional exercises, technology assisted self-monitoring, goal setting, education sessions and behaviour change techniques. Table 4 provides a summary of the 4 studies evaluating physical literacy interventions.
There was no reference to the role of rehabilitation in the promotion of physical literacy and rehabilitation across the life-course in the literature. However, thematic analysis identified several key components related to rehabilitation in the unique physical and social needs of older adults. The physical literacy model discussed by Jones et al. [53] differs from the previous frameworks by focusing only on older adults and using an ecological approach to integrate physical literacy across the life-course, regardless of physical or psychological constraint. Dudley presents a new model of physical literacy including policy considerations for key decision makers in the fields of public health, recreation, sport and education to support children and adults as they age [57]. Dudley argues that there is a need for "physically literate societies", that encompass more than education and sport agencies and should address the public health needs of all individuals of all ages. Jones et al. [53] provides an expansion of the current physical literacy definition to describe a new physical literacy model, informed by multi-disciplinary researchers and practitioners, with some consideration of the unique physical and social needs of older adults (>65 years).

The physical literacy model discussed by Jones et al. [53] differs from the previous frameworks by focusing only on older adults and using an ecological approach to integrate physical literacy into the lifestyles of aging adults. The traditional Whitehead model of physical literacy describes a pathway from birth to adulthood in which the individual develops physical literacy skills as a child that they can reflect on and grow with as they age. This model presents limitations for adults who may not have base functional movement skills, such as running, throwing, jumping or who have not engaged in these skills for many years. Additionally, the Whitehead model does not fully consider the new skills that adults are required to learn, as a result of age-related or health condition related function and mobility changes. For example, with chronic conditions, individuals will need to learn how to monitor their functional status and adjust as needed to maintain mobility. They will need to learn rehabilitation strategies, including strengthening, flexibility, endurance, and balance exercises that will promote maximum mobility. These findings highlight that the current physical literacy definition should be expanded to position physical literacy as a health disease determinant.

Social sectors promoting physical literacy

This review examined which social sectors are responsible for promoting physical literacy for adults. Recreational community programs designed for adults and older adults were most commonly referenced (n = 16). Health and medicine fields discussing the role of physical literacy with successful aging (n = 9), followed by education sectors supporting physical literacy for children and adults throughout the life-course (n = 8) were also commonly referenced. Sport associations (n = 5), and public health and policy fields (n = 2) were also noted in this review. Refer to Table 2: Nature of the Literature.

Physical literacy and rehabilitation

There was no reference to the role of rehabilitation in the promotion of physical literacy for adults, when examining the articles included in this review. However, thematic analysis identified several constructs related to rehabilitation and physical literacy. Optimal function and mobility were the most commonly reported constructs, followed by rehabilitation exercises (strength, flexibility, speed, endurance and balance), adherence to sustained physical activity, self-monitoring and self-management.

Accessing physical literacy for adults

All 22 papers focused on physical literacy for community dwelling adults and older adults. The following themes emerged when evaluating constructs related to how adults can successfully access experiences which build physical literacy in the community: daily access to recreational activities, accessible built environments, access to enjoyable physical activities, access to a variety of movement activities, social support, culturally relevant and financially viable options, education on safe/supportive movement, multiple formats, and tailored to community needs. A cross-sectional survey [52] of community dwelling Canadian older adults included in the review found that an “easy to use website”, and an email newsletter were the top 2 preferences when asked how older adults would like to receive information on physical literacy [52].

Discussion

This review demonstrates that literature generated to date has been largely theoretical and descriptive, exploring varying definitions and models to describe the promotion of a physically literate adult. Higher levels of physical literacy are theorized to provide benefits, to the individual and to societies, however research to support this is lacking. This review aimed to address 4 key objectives: 1) What are the critical components included when framing physical literacy for adults and older adults? 2) What is the role of physical literacy in promoting successful aging for adults? 3) What components are important to include in a physical literacy program when considering the functional rehabilitation needs of adults and older adults? 4) How do adults and older adults currently access and use physical literacy? When evaluating the critical components of physical literacy for adults, the literature presents debate questioning whether the current physical literacy definition (“the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life”) is accurate and inclusive to the needs of adults and older adults. For example, Cairney et al. [27] argues that the current physical literacy definition should be expanded to position physical literacy as a health disease determinant. Cairney depicts physical literacy as a holistic concept that entails reciprocal, intertwining motor, social, affect and motivational factors that are reinforced with knowledge [27]. Dudley et al. [57] defines physical literacy as the “knowledge, skills, understandings and values related to taking responsibility for purposeful physical activity and human movement across the life course, regardless of physical or psychological constraint”. Dudley presents a new model of physical literacy including policy considerations for key decision makers in the fields of public health, recreation, sport and education to support children and adults as they age [57]. Dudley argues that there is a need for “physically literate societies”, that encompass more than education and sport agencies and should address the public health needs of all individuals of all ages. Jones et al. [53] provides an expansion of the current physical literacy definition to describe a new physical literacy model, informed by multi-disciplinary researchers and practitioners, with some consideration of the unique physical and social needs of older adults (>65 years).
reconceptualized to include the following key components that encapsulate the characteristics central to physical literacy for adults and older adults; engagement in purposeful, social, and diverse physical activities, having the motivation and confidence for movement, knowledge of age-related changes and the role of physical activity and being able to self-adapt to physical changes. Many articles addressed the intersection between successful aging and physical literacy for adults, however varying frameworks were used to demonstrate the association. Successful aging is commonly associated with “avoiding disease and disability, having high cognitive, mental and physical function, being actively engaged in life, and being psychologically well adapted in later life [66].” Higgs [28] describes physical literacy as the foundation to successful aging. Higgs argues that there are eight physical literacy components (appropriate physical activity, cognitive function, psychological well-being, social connection, embracing life transitions, managing chronic conditions, mindful nutrition and designing movement opportunities for adults of all ages with all abilities) that will lead adults to successful aging [28]. Increasing physical activity and decreasing the risks for illness and mobility impairments are at the center of both physical literacy and successful aging, demonstrating the clear relationship between the constructs. Interestingly, even though there was reference to functional exercises aimed at improving and managing mobility and the new physical literacy models acknowledged the role of chronic conditions when promoting physical literacy for adults, no articles discussed the intersection of rehabilitation with physical literacy and successful aging. For example, Cairney’s physical literacy framework across the life course [27] includes a pathway linking chronic conditions to physical literacy by considering the impacts of conditions such as cardiovascular disease, Type 2 diabetes, obesity, high blood pressure, and osteoarthritis on function and mobility [27]. This framework acknowledges that the onset of chronic conditions may restrict movement opportunities for aging adults, forcing adaptations to movement behaviours and creating challenges when acquiring new movement experiences [27]. It can be applied that rehabilitation strategies are required to improve function and maintain participation in movement activities to ensure adults and older adults build capacity within their physical literacy as the requirements for movement and function change with age. Figure 2 illustrates the reciprocal association between physical literacy, successful aging, physical activity, and rehabilitation. This figure uses the thematic findings of the review and demonstrates the intersection between the complex role of the four components: rehabilitation, physical literacy, successful aging, and physical activity, in the promotion of physical literacy for adults. Function and mobility outcomes were commonly used in the assessment of physical literacy, however rehabilitation professionals, such as physiotherapists were not involved in the design and delivery of the programs. This omission is surprising since rehabilitation professionals have the expertise and skills to support physical literacy initiatives by sharing knowledge regarding the prevention and management of movement impairments [67]. Increased awareness about the intersection of rehabilitation and physical literacy by practitioners and policymakers is likely to increase the dissemination of these ideas.

When considering physical literacy interventions, this review demonstrates the dearth of research that has explored physical literacy in adults and older adults. The 4 physical literacy interventions in the review included both a physical activity component and an education component that addressed important behaviours such as motivation, self-efficacy with movement, and confidence. This demonstrates that the holistic nature of physical literacy for adults involves a multitude of constructs that go beyond physical competence. It is apparent that physical literacy is important for sustained participation in physical activity, but development of physical literacy for adults can occur through unstructured movement pursuits, such as recreational activities, daily routines, social interactions, and community involvement, in addition to structured movement pursuits such as sport, exercise, rehabilitation programs, healthcare visits and education programs. Two grey literature articles specifically described exercises designed to increase physical literacy for adults [45,60]. A Canadian Sport for Life Physical Literacy Movement Guide, prepared by Kitchen et al. presents 30 dynamic and functional movements, such as grapevine, squats and ladder drills that aim to improve the way adults move, as well as enjoy recreational movement [45]. Similarly, a conceptual paper by Roetert et al. [60] presents the following 5 key functional resistance exercises, aimed

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**Figure 2.** Physical literacy for adults through a rehabilitation lens. A reciprocal relationship between physical literacy, successful aging, physical activity and rehabilitation is demonstrated with the use of arrows pointing in both directions and connecting the thematic findings of the integrative review.
| Author, Year, Study Design | Study Objective | Population | PL Interventions | Outcomes utilized to measure PL | Results |
|---------------------------|----------------|------------|-----------------|-------------------------------|---------|
| Matz Costa [49], 2018 RCT | To evaluate the feasibility and outcomes of the Engaged4Life program (personally meaningful activity program). | Inactive community dwelling adults Average age = 75.5 \( N = 30 \) | PL intervention: Tech-assisted self-monitoring Psychoeducation Goal setting One on one peer mentoring Control group: self-monitoring (no tech) | - Physical activity: # of steps (Fitbit) - Cognitive Activity: # of cognitive activities engaged in each day (from a list of 14) - Social Interaction: # of social interactions engaged in each day and how stressful or positive these engagements were (scale of 1-5) - Personal Meaning: 4 questions that were rated on a scale 0-2 asking about what they did that day that was personally meaningful | Improvements in all 4 domains (greatest for # of steps) for the intervention group, however study not powered to detect a significant difference between the self-monitoring and the multi-intervention PL groups |
| Stathokostas [50], 2017 Cluster RCT | To study the longer-term levels of adherence to PA of older adults who have participated in the GFAL program; To determine the long-term functional fitness changes post-GFAL participation; To determine the long-term changes in psychosocial determinants of PA; To provide an exploratory description of factors associated with continued PA participation and to compare long-term GFAL outcomes to a group receiving booster sessions. | Community dwelling healthy, but inactive older adults \( N = 176 \) and average age = 70.3 | Eight-week community-based group GFAL program in 5 communities Participants attended 3 exercise sessions with one session including an additional education session Education topics included benefits of PA, strengthening and stretching, healthy eating, exercise adherence, exercise for chronic diseases, safety, and maintaining an exercise program at. The exercise classes included a cardio, strength, flexibility and balance. | - Physical function (Short SPPB) - Mobility disability (400 m walk) - Physical Fitness (Seniors Fitness Test) - PA (Phone FITT interview) - Exercise Participation | Improvements in exercise adherence with 66% exercise retention at 12 months. Functional and physical fitness outcomes gained during the eight-week GFAL program were maintained at the six-month follow up. Lack of motivation was reported as the second most common reason (32%) reported by non-adherents in the study. No change in self-efficacy and outcomes expectations. |
| Holler [51], 2019 Quasi-experimental | To assess the effects of a holistic physical exercise training on PL among physically inactive adults. | Inactive community dwelling adults Average age = 45 \( N = 60 \) | Exercise: strength, endurance and functional exercises Education with print material Cognitive exercises Physical activity games (involving walking and running) Tailoring exercises and education to meet participant needs Positive feedback | The following subjective reports (questionnaires) were used to provide a total PL score - Physical activity: IPAQ-SF - Attitude towards a physically active life: Stanford 5 City questionnaire - Exercise Motivation: Sport motivation Scale - Exercise self-confidence: 3 Self-efficacy Scales | Significant improvements were found for the domains of PA behaviour and exercise self-efficacy with no intervention effect for the other domains |
| Stathokostas [50], 2016 Pre-post study | To determine the functional fitness and psychosocial changes over an 8 week Get Fir for Active Living (GFAL) program for sedentary older adults | Community dwelling healthy, but inactive older adults Average age = 70 \( N = 210 \) | Education on exercises for chronic conditions, safety and how to maintain movement at home or community. Build PL skills and confidence through experiences in the gym Motivation strategies including goal setting. | - Self-efficacy scales including task specific self-efficacy and lifestyle self-efficacy - Outcome expectations scale | Significant improvements for self-efficacy, and SPPB. The timed up and go and LE strength tests improved significantly |
to start older adults on the path of physical literacy: scapular retraction, bridging, partial squat, grapevine and heel raises.

When examining how adults’ access and use physical literacy, the current literature primarily focuses on programs for community-dwelling adults and older adults and the need to build communities that support adults with their physical literacy journey. A 2020 cross-sectional survey of older adults by active aging Canada [52] found that “accessible environments” and “affordable opportunities” were the top two emerging themes when asked how to support older adults to be physically active. This survey also found that older adults would prefer to receive information on physical literacy with an easy-to-use website or an email newsletter, both highly accessible resources [52]. For physical literacy to be embraced by the older adult community and adapted as a disposition, there is a need to articulate what physical literacy entails for adults and older adults from a health and physical function lens.

**Implications for practice and research**

In the context of physical literacy for adults and older adults, individuals may have developmental skills that were established at an earlier age, which they retain to a greater or lesser extent from childhood. However, there are other physical literacy skills, such as self-monitoring of age-related changes, inclusive and diverse movements into everyday activities, the practice of core functional activities, such as rising from a chair and understanding and implementing rehabilitation strategies to address age-related changes as a means to maintaining optimal mobility. The traditional conceptualization of physical literacy does not fully account for aging and changes in function and mobility with aging. A key feature is that it is currently primarily based on a developmental model that is expanding one’s physical activity, not a developmental model where movement and activity is becoming more constrained due to age-related changes. This review adds value to the current literature on physical literacy frameworks and definitions, by highlighting the key components that are central to physical literacy for older adults. Future physical literacy interventions should be designed with a focus on the identified key components, including having the motivation and confidence to engage in meaningful, social, and diverse activities and having knowledge of age-related changes and understanding how to adapt to these changes. A pilot physical literacy intervention for adults (45–65 years) with 2 or more chronic conditions and delivered with a population health approach is currently underway. This intervention was developed iteratively based on the results of expert consensus group using nominal group technique to reach consensus on the key components required for a physical literacy intervention for adults [68]. In addition, semi-structured interviews were conducted with working adults (45–65 years) who are living with multiple chronic conditions to understand what physical literacy means to aging adults and how to effectively increase physical literacy awareness as a strategy to improving participation and adherence to physical activity, despite health challenges. Early findings indicate that physical literacy for adults and older adults involves increasing one’s capacity to be able to choose diverse movement activities that are enjoyable, while monitoring one’s own ability for movement, having the knowledge to identify early loss of movement components and knowledge to remediate restrictions. The development of physically literate adults and older adults will require collective action among organizations and sectors, such as rehabilitation specialists, public health units, and policy. Future research is needed to determine whether interventions delivered by rehabilitation professionals at a population level and aimed at improving physical literacy components important to optimal aging and the management of chronic conditions for adults and older adults will improve health outcomes, such as function and mobility. Additionally, future research is needed to effectively disseminate information and movement strategies at a population level to adults and older adults who will benefit the most from becoming physically literate.

**Strengths and limitations**

This integrative review offers the first synthesis of a variety of literature sources and evidence types on how physical literacy is framed for adults and older adults. The inclusion criteria are broad, allowing for a compilation of current literature on a new and complex topic. However, the extracted findings are not homogenous in this aspect. Our findings are limited by the number and quality of articles identified. Quantitative and qualitative studies that matched the eligibility criteria were limited, however those included contributed substantially with identified physical literacy components for adults and older adults in addition to the current physical literacy measurements and community interventions. The majority of literature included were from grey literature, including opinions and conceptual frameworks, decreasing the validity of findings. The included literature sources were conducted in 6 different countries with reference to active and inactive community adults ≥45 years, strengthening the external validity.

**Conclusion**

This review advances an understanding about physical literacy for adults and older adults and adds value in the fields of public health and policy by reconceptualizing the physical literacy construct to include the functional health needs of aging individuals. A shift in public understanding of what components contribute to physically literate adults and older adults can positively influence important aging outcomes and help guide program development where rehabilitation has part to play, aimed at disseminating important physical literacy strategies. This review has highlighted that having an awareness of the safe and purposeful activities available, the benefits of movement and how to sustain movement, through fluctuations in health and abilities, such as episodic fluctuations in multimorbidity is the foundation to becoming a physically literate adult and older adult.

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References

[1] Statistics Canada. Government of Canada - Action for seniors report [Internet]. 2014. Available from: https://www.canada.ca/en/employment-social-development/programs/seniors-action-report.html

[2] Ferrucci L, Cooper R, Shardell M, et al. Age-Related change in mobility: Perspectives from life course epidemiology and geroscience. J Gerontol A Biol Sci Med Sci. 2016;71(9):1184–1194.

[3] Roberts K, Rao D, Bennett T, et al. Prevalence and patterns of chronic disease multimorbidity and associated determinants in Canada. Health Promot Chronic Dis Prev Can. 2015;35(6):87–94.

[4] Broemeling A-M, Watson DE, Prebant F. Population patterns of chronic health conditions, co-morbidity and healthcare use in Canada: implications for policy and practice. Healthc Q. 2008;11(3):70–76.

[5] Marko M, Neville C, Prince M, et al. Lower-extremity force decrements identify early mobility decline among community-dwelling older adults. Phys Ther. 2012;92(9):1148–1159.

[6] Ryan A, Wallace E, O’Hara P, et al. Multimorbidity and functional decline in community-dwelling adults: a systematic review. Health Qual Life Outcomes. 2015;13(1):168.

[7] Kastner M, Cardoso R, Lai Y, et al. Effectiveness of interventions for managing multiple high-burden chronic diseases in older adults: a systematic review and Meta-analysis. CMAJ. 2018;190(34):E1004–12.

[8] de Vries NM, van Ravensberg CD, Hobbelen JSM, et al. Nijhuis-van der sanden MWG. Effects of physical exercise therapy on mobility, physical functioning, physical activity and quality of life in community-dwelling older adults with impaired mobility, physical disability and/or multi-morbidity: a Meta-analysis. Ageing Res Rev. 2012;11(1):136–149.

[9] Statistics Canada. Tracking Physical Activity Levels of Canadians, 2016–2019. [Internet]. 2019. Available from: https://www150.statcan.gc.ca/n1/daily-quotidien/190417/dq190417g-eng.htm

[10] Bullard T, Ji M, An R, et al. A systematic review and Meta-analysis of adherence to physical activity interventions among three chronic conditions: cancer, cardiovascular disease, and diabetes. BMC Public Health. 2019;19(1):636. Available from:

[11] Colley R, Garriguet D, Janssen I, et al. Physical activity of Canadian adults: accelerometer results from the 2007 to 2009 Canadian health measures survey. Heal Reports. 2011; 22(1):7–14.

[12] Tremblay MS, Warburton DER, Janssen I, et al. New Canadian physical activity guidelines. Appl Physiol Nutr Metab. 2011;36(1):36–46.

[13] Ding D, Kolbe-Alexander T, Nguyen B, et al. The economic burden of physical inactivity: a systematic review and critical appraisal. Br J Sports Med. 2017;51(19):1392–1409.

[14] Thavorn K, Maxwell CJ, Gruneir A, et al. Effect of sociodemographic factors on the association between multimorbidity and healthcare costs: a population-based, retrospective cohort study. BMJ Open.. 2017;7(10):e017264.

[15] Kahn E, Ramsey L, Brownson R, et al. The effectiveness of interventions to increase physical activity. A systematic review. Am J Prev Med. 2002;22(4 Suppl):73–107.

[16] Trost S, Owen N, Bauman A, et al. Correlates of adults’ participation in physical activity: review and update. Med Sci Sports Exerc. 2002;34(12):1996–2001.

[17] Baker P, Francis D, Soares J, et al. Community wide interventions for increasing physical activity. Cochrane Database Syst Rev. 2015;5(1):CD008366. DOI:10.1002/14651858.CD008366.pub3.

[18] Tseng E, Zhang A, Shogbesan O, et al. Effectiveness of policies and programs to combat adult obesity: a systematic review. J Gen Intern Med. 2018;33(11):1990–2001.

[19] Mönninghoff A, Kramer J, Hess A, et al. Long-term effectiveness of mHealth physical activity interventions: systematic review and Meta-analysis of randomized controlled trials. J Med Internet Res. 2021;23(4):e26699.

[20] Parekh AK, Goodman RA, Gordon C, et al.; HHS Interagency Workgroup on Multiple Chronic Conditions. Managing multiple chronic conditions: a strategic framework for improving health outcomes and quality of life. Public Health Rep. 2011;126(4):460–471.

[21] Rimmer J, Riley B, Wang E, et al. Physical activity participation among persons with disabilities: barriers and facilitators. Am J Prev Med. 2004;26(5):419–425.

[22] Pender N, Murdough C, Parsons M. Health promotion in nursing practice. 6th ed. Boston (MA): Pearson; 2010.

[23] World Health Organization (WHO) [Internet]. 2020 [Cited 2020 Mar 16]. Available from: https://www.who.int/news-room/fact-sheets/detail/rehabilitation.

[24] Grembowski L, Schaefer J, Johnson K, et al. A conceptual model of the role of complexity in the care of patients with multiple chronic conditions. Med Care. 2014;52(Supplement 2):S7–S14.

[25] Chodosh J, Morton S, Mojica W, et al. Meta-analysis: chronic disease self-management programs for older adults. Ann Intern Med. 2005;143(6):427–438.

[26] Paterson B. The shifting perspectives model of chronic illness. J Nurs Scholarsh. 2001;33(1):21–26.

[27] Cairney J, Dudley D, Kwan M, et al. Physical literacy, physical activity and health: toward an Evidence-Informed Conceptual Model. Sports Med. 2019;49(3):371–383.

[28] Higgs C, Cairney J, Jurba P, et al. Developing physical literacy: building a new normal for all Canadians. Physical Literacy and Adults. 8159.
[35] Whittomore R, Knaff K. The integrative review: updated methodology. J Adv Nurs. 2005;52(5):546–553.

[36] Frontera WR, Hughes VA, Fielding RA, et al. Aging of skeletal muscle: a 12-yr longitudinal study. J Appl Physiol. 2000;88(4):1321–1326. Available from: [53]

[37] Melzer D, Gardener E, Guralnik JM. Mobility disability in the Middle-aged: crossed associations in the English longitudinal study of ageing. Age Ageing. 2005;34(6):594–602.

[38] Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. BMJ Med Res Methodol. [Internet]. 2008;8(1):45.

[39] Joanna Briggs Institute. Critical Appraisal Tools [Internet]. 2017. Available from: https://joannabriggs.org/critical-appraisal-tools

[40] Baxter S, Killoran A, Kelly MP, et al. Synthesizing diverse evidence: the use of primary qualitative data analysis methods and logic models in public health reviews. Public Health. 2010;124(2):99–106.

[41] Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. 2021. Available from: www.covidence.org

[42] Moher D, Liberati A, Tetzlaff J, PRISMA Group, et al. Preferred reporting items for systematic reviews and Meta-analyses: the PRISMA statement. BMJ. 2009;339:b2535.

[43] Almond L. What is the relevance of physical literacy for adults? Int Counc Sport Sci Phys Educ. 2015;65(Bulletin Feature Physical Literacy):215–220.

[44] Whitehead M, Taplin L. Physical literacy as a journey. Int Counc Sport Sci Phys Educ. 2013;54(Bulletin Special Edition):52–60.

[45] Kitchen A. Physical literacy movement preparation for adults and older adults. City of Calgary Recreation; 2014. p. 1–13.

[46] Edwards LC, Bryant AS, Keegan RJ, et al. ‘Measuring’ physical literacy and related constructs: a systematic review of empirical findings. Sports Med. 2018;48(3):659–682.

[47] Huang Y, Sum K-WR, Yang Y-J, et al. Measurements of older adults’ physical competence under the concept of physical literacy: a scoping review. JERPH. 2020;17(18):6570.

[48] Matz-Costa C, Lubben J, Lachman ME, et al. A pilot randomized trial of an intervention to enhance the Health-Promoting effects of older adults’ activity portfolios: the Engaged4Life program. J Gerontol Soc Work. 2018;61(8):792–816.

[49] Stathokostas L, Speechley M, Little RMD, et al. Long-term evaluation of the “Get Fit for Active Living” Program. Can J Aging. 2017;36(1):67–80.

[50] Holler P, Jaunig J, Amort F-M, et al. Holistic physical exercise training improves physical literacy among physically inactive adults: a pilot intervention study. BMC Public Health. 2019;19(1):11.

[51] Stathokostas L, Speechley M, Doerksen S, et al. The get fit for active living demonstration project: evaluation of a canadian older adult physical activity education program. London (ON): Western University; 2016.

[52] Stathokostas L, Gotz A, Clark P. What Exactly is Physical Literacy? Perspectives from older adults and those who work with older adults [Internet]. Active Aging Canada. 2020. Available from: https://www.activeagingcanada.ca/assets/pdf/practitioners/physical-activity-literate/Physical-Literacy-and-Older-Adults.pdf

[53] Jones GR, Stathokostas L, Young BW, et al. Development of a physical literacy model for older adults - a consensus process by the collaborative working group on physical literacy for older Canadians. BMC Geriatr. 2018;18(1):13.

[54] McMahon SK, Park YS, Lewis B, et al. Older adults’ utilization of community resources targeting fall prevention and physical activity. Gerontologist. 2019;59(3):436–446.

[55] Campbell AM, Katz L. Older adults’ perceptions of the usefulness of technologies for engaging in physical activity: Using focus groups to explore physical literacy. Int J Environ Res Public Health. 2020;17(4):1144.

[56] Roetert EP, Ellenbecker TS, Kriellaars D. Physical literacy: why should we embrace this construct? Br J Sports Med. 2018;52(20):1291–1292.

[57] Dudley D, Cairney J, Wainwright N, et al. Critical considerations for physical literacy policy in public health, recreation, sport and education agencies. Quest. 2017;69(4):436–452.

[58] Roetert EP, Jefferies SC. Embracing physical literacy. J Phys Educ Recreat Danc. 2014;85(8):38–40.

[59] Longmuir PE, Tremblay MS. Top 10 research questions related to physical literacy. Res Q Exerc Sport. 2016;87(1):28–35.

[60] Roetert EP, Ortega C. Physical literacy for the older adult. Strength Cond J. 2019;41(2):89–99.

[61] Jones G, Stathokostas L. Letter to the editor: can older adults “walk” their way to successful aging? the case for physical activity literacy for an aging population”. J Aging Phys Act. 2016;24(3):341.

[62] Nielsen-Bohlman L, Panzer A, Kindig D. Health literacy: a prescription to end confusion. Washington, District of Columbia: National Academies Press; 2004.

[63] Steffen T, Hacker T, Mollerling L. Age- and gender-related test performance in community-dwelling elderly people: SIX-Minute walk test, berg balance scale, timed up & go test, and gait speeds. Phys Ther. 2002;82(2):128–137.

[64] Liu J, Quach B, Chung P. Further understanding of the senior fitness test: Evidence from community-dwelling high function older adults in Hong Kong. Arch Gerontol Geriatr. 2019;82:286–292.

[65] Goldberg A, Casby A, Wasielewski M. Minimum detectable change for single-leg-stance-time in older adults. Gait Posture. 2011;33(4):737–739.

[66] Kim S-H, Park S. A Meta-analysis of the correlates of successful aging in older adults. Res Aging. 2017;39(5):657–677.

[67] Ontario Physiotherapy Association. Physiotherapy in primary health care. Executive Summary. 2017. Available from: https://opa.on.ca/wp-content/uploads/Physiotherapists-Primary-Health-Care.pdf

[68] Petrusevski C, Richardson J, MacDermid J, et al. Framing physical literacy for adults through a rehabilitation lens: an expert consensus study. 2021. Manuscript in preparation.