


## REVIEW ARTICLE

# Impact of COVID-19 pandemic on mobility of older adults: A scoping review

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## Funding information

Coordenação de Aperfeiçoamento de Pessoal de Nível Superior—CAPES.

## Abstract

**Aims and objectives:** To identify the most frequent determinants of contact limitation on older adults' mobility addressed by the recommendations to mitigate mobility limitation during the COVID-19 pandemic and identify the recommendations characteristics and means of dissemination that might guide coping actions.

**Background:** Measures for physical contact restriction were implemented to prevent COVID-19 spread. These measures directly impacted older people, reducing their mobility, especially outside home environment. Health systems worldwide need to be prepared to implement strategies to mitigate negative effects of reduced mobility in this population.

**Design:** Scoping review using Arksey and O'Malley's methodological framework.

**Method:** Therefore, a scoping review was conducted in LILACS, CINAHL, MEDLINE, WEB OF SCIENCE and SCOPUS databases. Documents and reports with recommendations from government agencies were also consulted. Results were presented in a narrative synthesis based on a conceptual model of mobility proposed by Webber (*The Gerontologist*, 2010, 50, 443) regarding the most frequently addressed determinants, characteristics of the proposed interventions, and means of dissemination for the older person population.

**Findings:** Twenty-eight studies were selected for the final sample. According to Webber's model, most articles ( $n = 14$ ) presented the impacts on mobility from the perspective of physical determinants, relating this aspect to biological losses in the musculoskeletal system, and a minority assessed mobility in vital spaces, encompassing environmental ( $n = 3$ ) and financial ( $n = 1$ ) determinants. Also, the most frequent recommendation was that physical activity promotes maintenance of mobility and prevents the occurrence of adverse results, such as falls, fractures and functional decline. As to dissemination, digital technologies were recognised as a strategy to motivate, instruct and monitor exercise practice to increase mobility in older adults.

**Conclusion:** The main conditions related to the decline in mobility of older adults during COVID-19 pandemic were physical inactivity and sedentary lifestyle. The practice of physical activity is widespread and needs to be adapted according to individual

needs. Finally, digital technologies are essential tools in this period, but other alternatives should also be considered for low-income seniors.

**Implications for practice:** It is hoped that the gaps identified through this scoping review can help enhance the discussion on the broader assessment of mobility in older adults and the design of interventions when contact restriction is a reality.

#### KEYWORDS

ageing, COVID-19, locomotion, mobility, older adults, physical contact restriction, social isolation

## 1 | INTRODUCTION

Mobility can be defined as changing the position or location of the body as well as transferring, moving, and manipulating objects, walking, running and other forms of movement (World Health Organisation, 2001). Maintaining mobility is essential for older adults, as it promotes greater independence and quality of life. Mobility, as well as the ability to meet basic needs, the ability to learn, grow and make decisions, the ability to build and maintain relationships, and the ability to participate in society, is considered a priority in the World Health Organisation report for the decade of healthy ageing 2021–2030 (World Health Organisation, 2020, 2021).

Over the years, several conceptual frameworks have been developed to explore mobility in older adults (Baker et al., 2003; May et al., 1985; Peel et al., 2005; Stalvey et al., 1999). However, in 2010, Webber et al. proposed a more comprehensive theoretical framework to conceptualise mobility, addressing the influence and interaction of five determinants: cognitive, psychosocial, physical, environmental and financial (Webber et al., 2010).

In this model, mobility is represented in vital spaces or living spaces, which are physical and social environments through which a person moves in their daily lives. (Baker et al., 2003). These spaces include bedroom, house (i.e. house, apartment, establishment), the space outside the house (i.e. yard, parking), the neighbourhood (i.e. nearby streets or parks), community services (i.e. shops, banks, health institutions), the area within a country and the world itself (Baker et al., 2003; May et al., 1985; Taylor et al., 2019; Webber et al., 2010).

Reducing mobility in living spaces increases short-term mortality and healthcare costs among older adults (Boyle et al., 2010; Mackey et al., 2016; Sheets et al., 2021). Furthermore, it results in cognitive decline, frailty, institutionalisation, falls, hospitalisation and disability (Crowe et al., 2008; Gattás-Vernaglia et al., 2021; Kennedy et al., 2019; Sheppard et al., 2013).

In 2020, with the COVID-19 pandemic, access to vital spaces was limited by contact restriction measures (Rantanen et al., 2021). Contact restriction measures (i.e. physical or social) aim at limiting interaction with other people and curbing the spread of diseases (Szwarcwald et al., 2020). Although necessary in pandemic situations, the implementation of these measures has numerous consequences for the mobility of older people, especially outside the home environment.

### What does this research add to existing knowledge in gerontology?

- Most of the impacts on mobility in the older adults during the COVID-19 pandemic focused on physical determinants, with changes in the musculoskeletal system and movement behaviour.
- There is a predominance of studies that approach mobility from the perspective of physical determinants, and less emphasis is given to mobility in living spaces.
- Barriers related to acquiring technology and digital literacy to maintain mobility permeate the daily lives of the older adults, especially those living in low- and middle-income countries.

### What are the implications of this new knowledge for nursing care with older people?

- We emphasise the importance of nurses assessing and monitoring the mobility of the older adults in this period of confinement, in order to prevent functional decline.
- The nurse can act in the design and implementation of interventions to maintain mobility during the period of confinement.

### How could the findings be used to influence policy or practice or research or education?

- The findings from this scoping review bring to light the need for governments and health systems to be able to expand and consolidate the use of telehealth in both disease prevention and health promotion.
- More research on older adults' mobility in a more holistic view is needed to guide interventions, education and nursing policies.

Therefore, older adults stayed home for longer periods, restricted to a smaller area of circumscription, leading to decrease in the number of daily steps (Tison et al., 2020; Wang et al., 2020), and physical activity levels (Sasaki et al., 2021) as well as increased sedentary time (Browne et al., 2020). These changes affect the

physical determinants and may contribute to mobility decline over time (Venturelli et al., 2018).

Attention, executive function and working memory, which are part of the cognitive determinants, are also essential to maintain mobility. However, several studies have pointed to the indirect influence of COVID-19 pandemic on cognitive decline of older adults (Noguchi et al., 2021; Tsapanou et al., 2021). Psychosocial determinants such as fear of being infected by the virus outside home, feelings of uselessness and uncertainty about the future added to reduced ability to cope with the situation, reduce interest and motivation to be active (Lee et al., 2020).

Limited access to the community and external environment due to the COVID-19 pandemic reduces the opportunity to build ties with the neighbourhood and develop social networks, representing a barrier to life-space mobility (Miyashita et al., 2021). Socioeconomic status affects mobility in COVID-19 pandemic, as higher-income individuals were less affected regarding mobility. It is known that insufficient income is associated with worse physical function and lower walking speed (Haas, 2008; Litwin & Sapir, 2009; Szanton et al., 2010).

The impact of contact restriction measures as a means of preventing COVID-19 on the determinants of mobility is shown in Figure 1.

The consequence of this scenario is problematic, as mobility reduction in older people increases the risk for adverse events such as falls, depression, disability, dependence, and, eventually, the need for long-term care and services (Musich et al., 2018; Raggi et al., 2018). Thus, specialists in geriatrics and gerontology emphasise the need to establish interventions to hamper potential adverse effects of restricted mobility (Abrahams, 2020; Lakicevic et al., 2020; Sepúlveda-Loyola et al., 2020).

The COVID-19 pandemic posed a challenge never before faced. Efforts to reduce the burden of contact restriction in older people, their families and society are more than necessary. Worldwide, health systems must outline comprehensive care to optimise the mobility of the elderly, developing coping strategies and actions that make healthy ageing viable. Mapping the available evidence on the real impact of contact restriction measures on older adults mobility allows informed decision-making. It helps to implement safe preventive measures to minimise adverse effects of the pandemic on health and well-being.

Lessons learned from the COVID-19 pandemic regarding contact restriction measures may also provide opportunities for operationalising global strategies to encourage the maintenance of mobility. Also, the experience gained from this situation strengthens the need to adequately structure health services to meet demands of prevention, management and health rehabilitation of older adults in vulnerable situations.

## 2 | OBJECTIVE

To identify the most frequent determinants of contact limitation on older adults' mobility addressed by the recommendations to mitigate mobility limitation during the COVID-19 pandemic and identify the recommendations characteristics and means of dissemination that might guide coping actions.

## 3 | METHODS

### 3.1 | Study design

A scoping review was conducted and conceptualised as a tool to map main concepts that support a research area. Also, scoping reviews are useful for synthesising knowledge on emerging evidence, such as COVID-19, addressing issues beyond those related to the effectiveness or experience of interventions (Peters et al., 2020 version).

The study followed the recommendations proposed by Arksey and O'Malley, classified into five stages: identification of the guiding question; identification of relevant studies; studies selection; information mapping; grouping; summary and report of results (Arksey & O'malley, 2005). The guiding questions developed for this review were as follows: 'What are the recommendations of contact restriction measures to prevent COVID-19 on the mobility of older adults using Webber's mobility conceptual framework?' 'How are these recommendations being disseminated to reach the older population?'. Webber et al. (2010) conceptualise mobility using a holistic approach that recognises key determinants influencing mobility: cognitive, psychological, physical, environmental and financial. We considered these determinants as possible risk factors for mobility loss and used them to categorise and discuss the recommendations retrieved from the literature. We used the Preferred Report Items extension for systematic reviews and the Meta-Analysis extension for scoping studies (PRISMA-scr) (Tricco et al., 2018) to guide and report on the review (File S4). A protocol was developed to document the main definitions, data search,

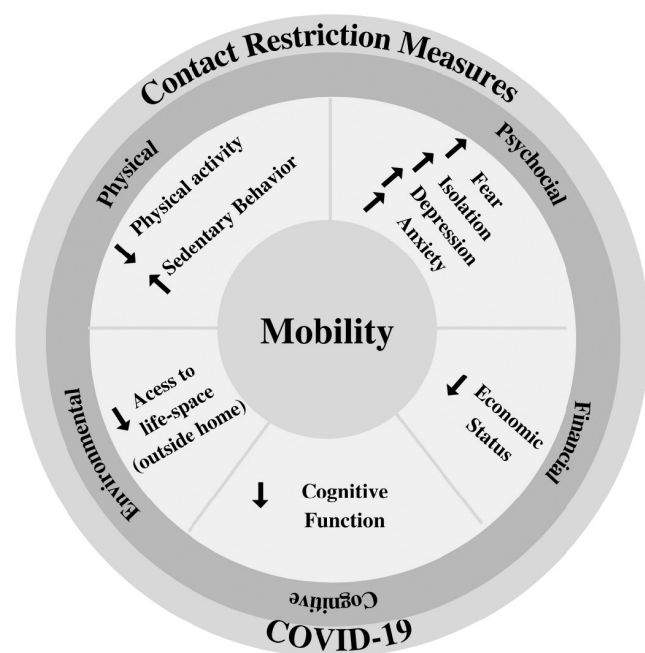


FIGURE 1 Consequences of contact restriction measures to prevent COVID-19 on mobility determinants. Teresina, Piauí, Brazil, 2021

inclusion criteria, exclusion criteria and organisation based on discussions among the review team (File S1). The review registration was performed on the *Open Science Framework* (OSF)- [osf.io/8wyfg](https://osf.io/8wyfg) platform.

### 3.2 | Key-terms

Literature search was guided by the PCC mnemonic strategy (Population, Concept and Context) for the inclusion of studies based on the research question, with the following definitions being adopted:

### 3.3 | Population

We considered studies involving older adults; however, no age limit was defined for such classification, as this chronological marker may vary according to region.

### 3.4 | Concept

Two concepts were used in this review. The primary concept is mobility, conceived as the independent movement from one point to another, constituting an essential factor for maintaining autonomy and independence (World Health Organisation, 2001). The second concept is physical and social contact restriction measures, which are interventions to limit interaction with other people and curb the spread of COVID-19 (Szwarcwald et al., 2020; Wilder-Smith & Freedman, 2020).

### 3.5 | Context

The context of this review was studies related to the COVID-19 pandemic and the Sars-Cov-2 virus.

### 3.6 | Search strategy

Search was performed using a standardised protocol in the following databases accessed through the CAPES Portal:

- Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), obtained in Biblioteca Virtual em Saúde (BVS).
- *Cumulative Index to Nursing and Allied Health Literature* (CINAHL).
- *Medical Literature Analysis and Retrieval System Online* (MEDLINE), via PubMed.
- Web of Science, via coleção primária (Thomson Reuters Scientific).
- SCOPUS.

Initially, MEDLINE and CINAHL were searched in November 2020 to retrieve articles on the subject. Titles and abstracts were

analysed, and the words contained in them elaborated the complete search strategy. Descriptors in the Medical Subject Headings (MeSH), CINAHL title, Health Sciences (DeCS) and uncontrolled descriptors combined through the Boolean operators 'AND' and 'OR' were used to elaborate the search strategy. The search strategy in the databases can be accessed in File S2.

The following documents and reports with recommendations from government organisations were also consulted:

*World Health Organisation* (WHO)—[https://www.who.int/docs/default-source/documents/social-determinants-of-health/covid19-advice-older-adults-qandas-cleared.pdf?sfvrsn=2e17964b\\_6](https://www.who.int/docs/default-source/documents/social-determinants-of-health/covid19-advice-older-adults-qandas-cleared.pdf?sfvrsn=2e17964b_6).

*National Health Service UK* (NHS)—[https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/health--wellbeing/the-impact-of-covid-19-on-older-people\\_age-uk.pdf](https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/health--wellbeing/the-impact-of-covid-19-on-older-people_age-uk.pdf).

The Centre for Evidence-Based Medicine (University of Oxford)—<https://www.cebm.net/covid-19/maximising-mobility-in-the-older-people-when-isolated-with-covid-19/>.

Ministério da Saúde do Brasil (MS)—<https://www.gov.br/saude/pt-br/coronavirus/publicacoes-tecnicas/recomendacoes/orientacoes-sobre-a-pratica-de-atividade-fisica-durante-o-periodo-de-pandemia/view>.

The words 'mobility'; 'older adults'; 'pandemics', 'COVID-19'; 'physical activity', and 'aged' were used for searching the grey literature.

### 3.7 | Eligibility

The following criteria were used for inclusion: complete manuscripts available in the three languages (Portuguese, English and Spanish); with different methodologies (original articles, literature reviews, editorials, guidelines, protocols and conference abstracts) that addressed the recommendations on contact restriction measures and the impacts on mobility of older people related to COVID-19. The reference list of all eligible articles was accessed to identify additional studies; however, none of the articles met the inclusion criteria. Manuscripts that did not address the older adults population and did not report the relationship between social distance and mobility in the older adults were excluded. After the last search (June 6, 2021) on indexed sources and grey literature, articles were grouped and imported into EndNote X9 software to organise references and remove duplicates.

### 3.8 | Studies selection

Two reviewers independently read titles and abstracts to identify relevant studies. Subsequently, full texts were examined considering our inclusion criteria. Situations of disagreement between reviews were resolved through discussion with a third reviewer.

### 3.9 | Tracking data

#### 3.9.1 | Data extraction

We used the Joanna Briggs Institute (JBI) recommendation for data extraction. The following information was included: article number, author, year of publication, country, study design, title, abstract, objective, journal, references from manual search, population, main results, recommendations, affiliation with a professional association or organisation, disclosure and other relevant data. Initially, a pilot extracting five articles was conducted to verify the compliance of the extracted data and identify possible information to be aggregated.

One of the review authors conducted data extraction, which a second author checked. Disagreements were resolved through discussion. The methodological quality of the primary studies was not assessed, as this aspect is not taken into account in scoping reviews (Peters et al., 2020).

#### 3.9.2 | Data encoding and synthesis

We chose to group data according to the following approach: studies showing the impacts of contact restriction measures on mobility;

studies presenting interventions to maintain mobility during the restriction period; and studies mentioning the use of technology in interventions to motivate, guide and monitor the mobility of older adults. Data were presented using tables with a narrative summary.

## 4 | RESULTS

### 4.1 | Studies selection

A total of 1307 references were retrieved from searches in databases and four from grey literature up to June 2021. Of these, 457 studies were excluded after duplicates removal. Then, titles and abstracts of 854 articles were analysed, resulting in the subsequent eligibility of 58 studies. Thirty articles were excluded for not providing relevant information to answer the research questions. Thus, we included 28 studies for full-text analysis. Figure 2 presents the study flowchart:

#### 4.1.1 | Description of included studies

Twenty-eight articles were selected in this review, of which 24 are from databases and four from grey literature. Regarding

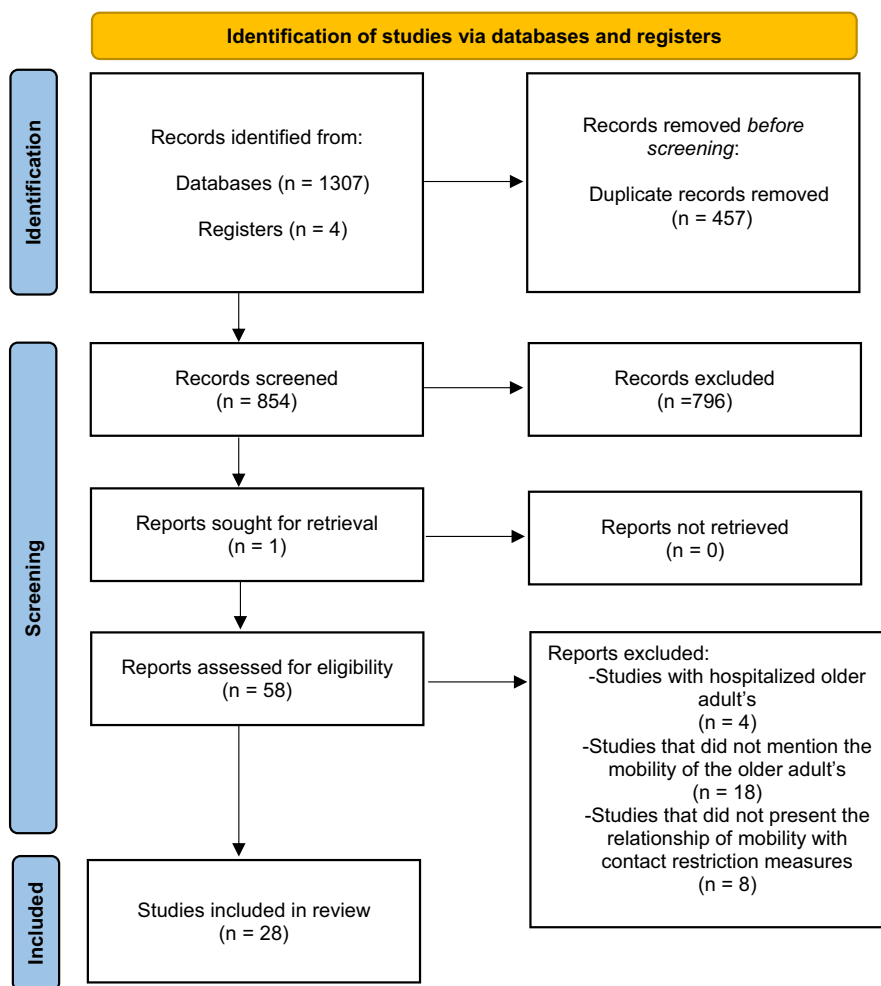


FIGURE 2 Flowchart for studies selection, PRISMA-ScR (2020). Teresina, Piauí, Brazil, 2021

articles found in the databases, 16 (57%) were identified in Medline/PubMed, four (14%) in Scopus, three (11%) in Web of Science, one in Cinahl (4%) and four in other sources (14%). Regarding the grey literature, reports were selected from the following organisations: World Health Organisation (WHO), Age UK, Center for Evidence-Based Medicine—University of Oxford (CEBM), and Ministério da Saúde (MS) d Brazil. Studies were published between 2020 and 2021, and 27 (96%) were written in English. As for the scope of publications, seven studies were observational (25%), six editorial (21%), four narrative reviews (14%), three letters to the editor (11%), two comments (7%), two service reports (7%), an opinion article (4%), and informative (4%), a recommendation manual (4%) and an experimental study (4%). A methodological approaches of articles included in the scoping review are shown in Figure 3.

The included articles were grouped into three categories and analysed based on the conceptual mobility model proposed by Webber et al. (2010), namely (1) articles describing risk factors for mobility loss as a consequence of the contact restriction measures, using Webber's mobility conceptual framework ( $n = 17$ ) (Abrahams, 2020; Aung et al., 2020; Bouillon-Minois et al., 2020; Browne et al., 2020; Goethals et al., 2020; Grant et al., 2020; Guadalupe-Grau et al., 2020; Machado et al., 2020; Mishra et al., 2021; Moro & Paoli, 2020; Omura et al., 2020; Pelicioni & Lord, 2020; Perracini et al., 2021; Rantanen et al., 2021; Roschel et al., 2020; Saraiva et al., 2021; Yang et al., 2020); (2) articles describing the characteristics of recommendations to mitigate the decline in older adult's mobility ( $n = 8$ ) (Hartmann-Boyce et al., 2020; Jiménez-Pavón et al., 2020; Lakicevic et al., 2020; Marcos-Pardo et al., 2020; Ricci et al., 2020; Saúde, 2020; Sepúlveda-Loyola et al., 2020; World Health Organisation, 2020); and, finally, (3) articles describing the means of dissemination of recommendations to mitigate the decline in older adult's mobility ( $n = 14$ ) (Aubertin-Leheudre & Rolland, 2020; Aung et al., 2020; Banskota et al., 2020; Gao et al., 2020; Goethals et al., 2020; Hartmann-Boyce et al., 2020; Machado et al., 2020; Marcos-Pardo et al., 2020; Omura et al., 2020; Pelicioni & Lord, 2020; Perracini

et al., 2021; Ricci et al., 2020; Saraiva et al., 2021; Sepúlveda-Loyola et al., 2020; Yang et al., 2020).

## 4.2 | Risk factors for mobility loss

According to the conceptual model of Webber et al. (2010), none of the identified studies addressed the cognitive, psychological and environmental determinants of mobility. Of all articles included in this review, 78% ( $n = 14$ ) of them explained mobility by its physical determinants (Abrahams, 2020; Aung et al., 2020; Bouillon-Minois et al., 2020; Browne et al., 2020; Goethals et al., 2020; Grant et al., 2020; Guadalupe-Grau et al., 2020; Machado et al., 2020; Mishra et al., 2021; Moro & Paoli, 2020; Omura et al., 2020; Pelicioni & Lord, 2020; Roschel et al., 2020; Yang et al., 2020) and only 5% ( $n = 1$ ) explained the influence of financial factors on mobility (Perracini et al., 2021).

Studies that addressed the physical determinants of mobility focused mainly on changes related to movement behaviour (physical activity and sedentary behaviour) and on the biological losses of the skeletal muscle system. The articles also cited the consequences of reduced mobility from a broader perspective with the involvement of different organic systems (cardiovascular, metabolic, immune, bone, muscle and joint) and subjective issues related to health, such as pain and quality of life (Abrahams, 2020; Aung et al., 2020; Bouillon-Minois et al., 2020; Browne et al., 2020; Goethals et al., 2020; Grant et al., 2020; Guadalupe-Grau et al., 2020; Machado et al., 2020; Mishra et al., 2021; Moro & Paoli, 2020; Pelicioni & Lord, 2020; Roschel et al., 2020; Yang et al., 2020).

Also, a study ratified the influence of financial determinants on mobility, showing that older adults with high income (<4 minimum wages) and high education had greater reduction in life-space mobility in the course of the COVID-19 pandemic (Perracini et al., 2021).

Details on the main impacts on mobility according to the determinants proposed by Webber et al., 2010 and their consequences are presented in Table 1.

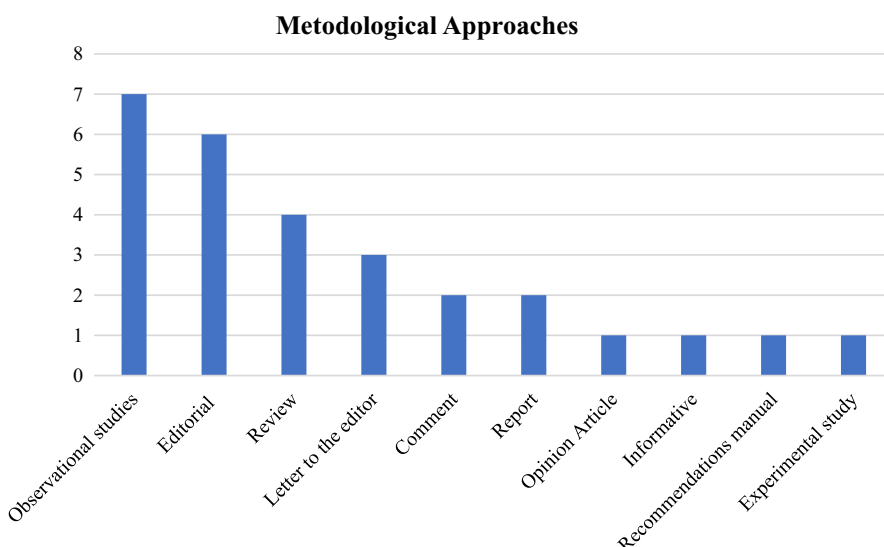


FIGURE 3 Methodological approaches of articles included in the scoping review. Teresina, Piauí, Brazil, 2021

**TABLE 1** Consequences of contact restriction measures (COVID-19) on mobility of older adults according to the cognitive, psychosocial, physical, environmental and financial risk factors for mobility loss, using the Webber conceptual framework (Webber et al., 2010)

Consequences of contact restriction measures (COVID-19) on mobility of older adults according risk factors for mobility loss				
	Direct	References	Indirect (increased risk)	References
Cognitive determinants (n = 0)	No articles were identified	-	-	-
Psychosocial determinants (n = 0)	No articles were identified	-	-	-
Physical determinants (n = 14)	Reduced physical activity	Bouillon-Minois et al. (2020), Goethals et al. (2020), Grant et al. (2020), Machado et al. (2020), Moro and Paoli (2020), Omura et al. (2020), Saraiva et al. (2021), World Health Organisation, 2020, Yang et al. (2020)	Falls	Abrahams (2020), Aung et al. (2020), Bouillon-Minois et al. (2020), Moro and Paoli (2020), Pelicioni and Lord (2020)
	Increased sedentary behaviour	Bouillon-Minois et al. (2020), Browne et al. (2020), Grant et al. (2020), Machado et al. (2020), Mishra et al. (2021)	Fractures	Abrahams (2020), Bouillon-Minois et al. (2020), Moro and Paoli (2020)
	Decreased number of daily steps	Browne et al. (2020), Mishra et al. (2021)	Sarcopenia	Bouillon-Minois et al. (2020), Roschel et al. (2020)
	Decreased protein synthesis and increased protein degradation	Moro and Paoli (2020)	Frailty	Roschel et al. (2020)
	Loss of muscle strength	Abrahams (2020), Aung et al. (2020), Guadalupe-Grau et al. (2020), Machado et al. (2020), Pelicioni and Lord (2020), Roschel et al. (2020)	Loss or reduction of independence	Goethals et al. (2020), Yang et al. (2020)
	Loss of muscle mass	Machado et al. (2020), Moro and Paoli (2020), Pelicioni and Lord (2020), Roschel et al. (2020)	Pain	Abrahams (2020)
	Loss of muscle power	Machado et al. (2020)	Osteoarticular problems	Abrahams (2020), Omura et al. (2020)
	Loss of muscle quality	Machado et al. (2020)	Cardiovascular Diseases	Omura et al. (2020)
	Reduced flexibility	Aung et al. (2020)	Hyperglycemia	Omura et al. (2020)
	Reduced balance	Pelicioni and Lord (2020)	Dysfunctions in the immune system	Yang et al. (2020)
	Reduced functional capacity	Guadalupe-Grau et al. (2020), Machado et al. (2020)	Deficiency	Moro and Paoli (2020)
	Reduced aerobic and cardiorespiratory capacity	Aung et al. (2020), Pelicioni and Lord (2020)	Reduced quality of life	Yang et al. (2020)
	Disuse of skeletal muscles	Machado et al. (2020)		
	Neuromuscular deficits of the lower limbs	Machado et al. (2020)		
Physical deconditioning	Abrahams (2020)			
Environmental determinants (n = 0)	No articles were identified	-	-	-
Financial Determinants (n = 1)	Low income	Perracini et al. (2021)	Reduced mobility in living spaces	Perracini et al. (2021)

A graphical representation in word cloud format was developed to illustrate the impacts of contact restriction measures on physical determinants of older adults mobility and its consequences. The length of each term is proportional to its representation in the review. A word cloud can be seen in [Figure 4](#).

The assessment of mobility as proposed by Webber as the ability to move across life-spaces was described in three articles using the Life-space Assessment (LSA) questionnaire (Perracini et al., 2021; Rantanen et al., 2021; Saraiva et al., 2021). The first study (Rantanen et al., 2021) was conducted in Finland and showed significant changes during the lockdown period caused by COVID-19 in the score for active ageing, life-space mobility and significant decrease in quality of life ( $p < .001$ ) compared to two years before.

The second study was conducted in Brazil and showed a decrease from 74% to 19% in the proportion of older people who reported leaving the house once a week for external activities before and after quarantine. In addition, the proportion of older people who leave home every day was also reduced from 29% to 2%. Regarding the average scores of the Life-Space Assessment questionnaire (LSA)-Brazilian version, there was a drop from 42 points to 21 points during the quarantine ( $p < .001$ ) and most older people (79%) decreased their life-space mobility by five points or more, meeting the criteria of restricted life-space mobility (Saraiva et al., 2021).

The Life-Space Assessment (LSA) is an instrument that provides a self-reported measure of life-space mobility. It estimates the distance covered in previous weeks at five levels: (1) bedrooms beyond the bedroom, (2) areas outside the house (i.e. balcony, backyard, hallway of an apartment building or garage), (3) neighbourhood, (4) outside the neighbourhood but within the city; and (5) locations outside the city. The total points range from 0 to 120 points, and the higher the score, the greater the life-space mobility (Baker et al., 2003).

Also, concerning the previous study, physical activity significantly decreased, from 42% to 26% in older adults who were already active at least three times a week ( $p < .001$ ) during the quarantine caused by COVID-19. Restricted mobility in the living space was associated with higher levels of impact on quality of life, with an odds ratio (OR) of 2.18 (95% CI). In addition, frail older adults had a significantly higher risk of having their quality of life affected by restricted

mobility in living spaces during the pandemic with an odds ratio (OR) of 5.80 (95% CI;  $p < .001$ ) (Saraiva et al., 2021).

Finally, the last study conducted by Perracini et al. (2021) conducted in Brazil showed that the mean score of the LSA questionnaire dropped from 64.0 (SD 26.0) to 37.8 (SD 22.1) from the pre-pandemic period to the ongoing period of the pandemic and a significant reduction in LSA scores of level 2, 3, 4 and 5 were observed. Furthermore, regarding social determinants of health, the reduction in life-space mobility was greater among black people, who lived alone and aged between 70 and 79 years compared to older adults aged 80 years and over (Perracini et al., 2021).

Although many articles retrieved in the initial search addressed the influence of contact restriction measures on psychosocial issues (e.g. loneliness, isolation, anxiety, depression, cognitive decline, leaving less home to pharmacies, gyms and supermarkets) no studies were found addressing the relationship of these determinants with older adults mobility during the period of the COVID-19 pandemic and, therefore, these determinants (environmental, psychosocial, cognitive) were not considered in this review.

### 4.3 | Characteristics of the recommendations to mitigate the decline in older adult's mobility

In general, the selected studies offered the practice of physical exercises at home to improve mobility, strength, flexibility, balance, coordination and muscle contraction, preventing the onset of chronic diseases and reducing the risk of falls and fractures, as a first-level recommendation. Interventions proposed in the articles (Hartmann-Boyce et al., 2020; Jiménez-Pavón et al., 2020; Lakicevic et al., 2020; Marcos-Pardo et al., 2020; Ricci et al., 2020; Saúde, 2020; Sepúlveda-Loyola et al., 2020; World Health Organisation, 2020) are based on guidelines of the World Health Organisation and suggest orientation related to modality, frequency, time and intensity. A multicomponent, home-delivered training program has been suggested for older adults with type 2 diabetes, and chronic inflammatory musculoskeletal and rheumatic diseases. (Guadalupe-Grau et al., 2020). Regarding frail older adults, resistance training in home environment is proposed to mitigate physical inactivity and improve



FIGURE 4 Graphic representation of the impacts of contact restriction measures on physical determinants of mobility of older adults and its consequences. Teresina, Piauí, Brazil, 2021



muscle function and functional performance (Machado et al., 2020; Sepúlveda-Loyola et al., 2020).

Recommendations for reducing physical inactivity and maintaining mobility, such as spending long periods sitting in front of the television or using a cell phone, and participating in activities of daily living (e.g. gardening, walking around the house, and going up and down stairs, were emphasised; Browne et al., 2020; Mishra et al., 2021; Omura et al., 2020; Ricci et al., 2020; Saúde, 2020; World Health Organisation, 2020).

The importance of activities involving mobility in residential spaces to improve the quality of life and active ageing is also highlighted (Rantanen et al., 2021). As well as strengthening of government policies aimed at older adults, focusing on comprehensive care and evaluation and monitoring of mobility (Perracini et al., 2021).

The details of the recommendations for maintaining mobility are presented in Table 2.

#### 4.4 | Means of dissemination of the recommendations to mitigate the decline in older adult's mobility

Digital technologies were mentioned by 54% ( $n = 14$ ) of the articles (Aubertin-Leheudre & Rolland, 2020; Aung et al., 2020; Banskota

et al., 2020; Gao et al., 2020; Goethals et al., 2020; Hartmann-Boyce et al., 2020; Machado et al., 2020; Marcos-Pardo et al., 2020; Omura et al., 2020; Pelicioni & Lord, 2020; Perracini et al., 2021; Ricci et al., 2020; Saraiva et al., 2021; Sepúlveda-Loyola et al., 2020; Yang et al., 2020) as crucial to the dissemination of physical activity guidelines. Additionally, these technologies help motivate and monitor progression. A variety of tools were suggested in Table 3.

The detailed characterisation of the articles included in this review can be observed in File S3.

Overall, editorials and letters to the editors call the attention to the alarming consequences of contact restriction measures on mobility of older adults and reinforced the role of exercise training as a primary intervention to mitigate mobility loss.

## 5 | DISCUSSION

The objective of this review was to identify the most frequent determinants of contact limitation on older adults' mobility addressed by the recommendations to mitigate mobility limitation during the COVID-19 pandemic and identify the recommendations characteristics and means of dissemination that might guide coping actions. Impacts related to mobility were mainly concentrated on physical

TABLE 2 Recommendations to mitigate the decline in older adult's mobility as the consequence the of the contact restriction measures due to the pandemic of COVID-19

Recommendation	Guidance	Public	References
Physical Exercise	Modality: multicomponent exercises (aerobic and resistance). Frequency: 5 days a week. Time: 150 to 300min per week. Intensity: moderate to vigorous	Older adults in general	Aung et al. (2020), Hartmann-Boyce et al. (2020), Jiménez-Pavón et al. (2020), Lakicevic et al. (2020), Marcos-Pardo et al. (2020), Ricci et al. (2020), Roschel et al. (2020), Saúde (2020), Sepúlveda-Loyola et al. (2020), World Health Organisation, 2020
	7 warm-up and activation exercises. 6 strength exercises of the lower and upper limbs. 7 final relaxation exercises.	Older adults with type 2 diabetes and chronic inflammatory rheumatic and musculoskeletal diseases.	Guadalupe-Grau et al. (2020)
	Endurance exercises (squatting, stepping over obstacles and climbing stairs) Balance exercises (multidirectional weightlifting, line walking, standing on one leg) Functional exercises (walking, jumping rope)	Frail Older Adults	Machado et al. (2020), Sepúlveda-Loyola et al. (2020)
Limiting sedentary behaviour	Avoid spending long periods sitting in front of the television or using a cell phone and participate more in activities of daily living (e.g. gardening, walking around the house, and going up and down stairs)	Older adults in general	Browne et al. (2020), Mishra et al. (2021), Omura et al. (2020), Ricci et al. (2020), Saúde (2020), World Health Organisation, 2020
Strengthening of public policies	Implementation of activities that involve mobility in residential spaces to improve quality of life and active ageing	Government organisations and professionals in health, architecture, engineering.	Rantanen et al. (2021). Improving older adult care with a focus on comprehensive care and mobility assessment and monitoring (Perracini et al., 2021)

**TABLE 3** Means of disseminations of the recommendations to mitigate the decline in older adult's mobility under the contact restriction measures (COVID-19)

Means of disseminations of the recommendations to mitigate the decline in older adult's mobility		
	Type	References
Digital technologies (n = 14)	Booklets	Goethals et al. (2020)
	Videoclips (DVD)	Aung et al. (2020), Goethals et al. (2020), Marcos-Pardo et al. (2020), Sepúlveda-Loyola et al. (2020)
	Telehealth programs	Hartmann-Boyce et al. (2020), Machado et al. (2020), Omura et al. (2020), Pelicioni and Lord (2020), Saraiva et al. (2021), Sepúlveda-Loyola et al. (2020)
	Applications for mobile devices	Hartmann-Boyce et al. (2020), Ricci et al. (2020), Sepúlveda-Loyola et al. (2020)
	Exergames.	Aubertin-Leheudre and Rolland (2020)
	Virtual Reality Exercises	Gao et al. (2020), Hartmann-Boyce et al. (2020), Yang et al. (2020)

and financial determinants. No studies addressed the relationship of other determinants (cognitive, psychosocial and environmental) of older adults mobility during the COVID-19 pandemic.

The theoretical structure proposed by Webber et al. (2010) points to five determinants that interact with each other and suffer transversal influences from gender, culture and biography, which makes mobility more complex. Based on this assumption, it is clear that there is still a gap regarding mobility in older, as most studies focused only on a specific determinant without addressing the inter-relationship of these factors (Webber et al., 2010).

Results also showed that physical activity is a consensual recommendation to maintain mobility and reduce functional decline. In addition, digital technologies were highlighted as a tool to conduct interventions and monitor health. We observed that most manuscripts were based on expert opinions or narrative reviews, revealing that the impact of the COVID-19 pandemic on mobility is not yet fully understood.

Future cohort studies will be able to identify mobility trajectories and identify their determinants. The general explanation for the lack of observational studies is the restriction of contact that prevails in face-to-face assessment, digital illiteracy and difficulties of older people in accessing technologies. Worldwide, research efforts are primarily directed at suppressing contamination and managing severe cases of COVID-19 to prevent deaths. As result, some areas of research face a lack of funding and structure.

## 5.1 | Consequences of contact restriction measures (COVID-19) on mobility of older adults

Contact restriction, a preventive measure implemented to mitigate the spread of COVID-19, affects all citizens, especially older adults, representing a challenge with significant health risks. From the perspective of physical determinants, physical inactivity can significantly increase the risk of sarcopenia and decrease muscle strength and power (Narici et al., 2021). Periods of muscle disuse

lead to rapid muscle atrophy and decline in muscle strength (Aung et al., 2020; Guadalupe-Grau et al., 2020; Machado et al., 2020; Moro & Paoli, 2020; Pelicioni & Lord, 2020; Roschel et al., 2020). This damage is explained by the anabolic resistance resulting from the imbalance of proteins, important macromolecules in the reconstruction of muscles and prevention of muscle wasting, which has its synthesis reduced and degradation increased in the absence of movement stimuli (Moro & Paoli, 2020).

Worsening glycaemic control is related to impaired peripheral insulin resistance due to the inability of skeletal muscle to increase glucose uptake in situations of restricted mobility, resulting in hyperglycaemia and inflammation (Omura et al., 2020; Roschel et al., 2020). In addition, physically inactive older adults may spend a lot of time sitting in front of the television or cell phone, which reduces the number of daily steps and, in the long run, may increase intradiscal pressure on the spinal vertebrae, affecting flexibility, balance, and gait and increasing risk for osteoarticular diseases that mainly affect the lower limbs (Bouillon-Minois et al., 2020; Browne et al., 2020; Goethals et al., 2020; Mishra et al., 2021; World Health Organisation, 2020).

Another important aspect related to restriction measures from the perspective of environmental determinants is the reduction of life-space mobility. This construct represents the older adults' concentric areas, from home to the city and beyond. All these areas comprise five categories of determinants, which exert a more significant influence as the older person moves away from home. Mobility impairments may limit access to different living spaces and negatively interfere with active ageing, quality of life and frailty (Rantanen et al., 2021; Saraiva et al., 2021).

According to Perracini et al. (2021), gender, culture and biography (history of personal life) also have a role in reducing life-space mobility. Their study shows that black people, people who lived alone and aged between 70 and 79 years, were more affected as to their life-space mobility. Inequalities in employment, income, health vulnerability, the presence of diseases and social isolation may explain the findings for the lower mobility of the elderly during the COVID-19 pandemic (Perracini et al., 2021).

Studies show that the consequences of contact restriction measures on older adults mobility, in addition to physiological losses resulting from ageing and reduced mobility, lead to several adverse outcomes, such as falls, fractures, increased dependence, reduced functional capacity and quality of life (Aung et al., 2020; Bouillon-Minois et al., 2020; Moro & Paoli, 2020; Pelicioni & Lord, 2020; Rantanen et al., 2021; Yang et al., 2020). The authors also point out that the reduction in the practice of physical activity appears as a negative effect of these measures to curb the spread of COVID-19, with the potential to worsen the health of older people and contribute to the onset of sarcopenia, frailty and other cardiometabolic abnormalities (Bouillon-Minois et al., 2020; Moro & Paoli, 2020; Roschel et al., 2020).

## 5.2 | Recommendations to mitigate the decline in older adult's mobility

Articles included in this review often pointed physical activity to alleviate harmful effects of contact restriction on older adults mobility. Physical training in home environment emerges as an effective and viable strategy to preserve physical and mental well-being of older people (Abrahams, 2020; Hartmann-Boyce et al., 2020; Lakicevic et al., 2020; Sepúlveda-Loyola et al., 2020; World Health Organisation, 2020).

Exercise is also used as a first-level intervention to reduce risk of falls and fractures, colon and breast cancer, and it works to protect and combat chronic non-communicable diseases such as high blood pressure and diabetes. Finally, it influences the prevention of geriatric syndromes with high disabling power, such as sarcopenia and frailty (Hartmann-Boyce et al., 2020; Saúde, 2020; World Health Organisation, 2020).

The multicomponent exercise modality is recommended for older adults staying home, including aerobic, resistance, balance, coordination and mobility training exercises with projection to include eight to ten exercises, performed in 1 to three sets with eight to 15 reps (Abrahams, 2020; Jiménez-Pavón et al., 2020; Lakicevic et al., 2020; Machado et al., 2020).

These exercises do not require specific equipment. Exercises with bodyweight, chair, PET bottle (300–500ml content) or rubber band are recommended as these items are commonly available at home. Aerobic capacity can be trained by walking indoors, dancing, doing household chores (cleaning and gardening), or walking up and downstairs. Resistance exercises can be performed by squatting on a chair, sitting and rising from a chair, and carrying light to moderate weight food items (Abrahams, 2020; Hartmann-Boyce et al., 2020; Jiménez-Pavón et al., 2020; Machado et al., 2020; Marcos-Pardo et al., 2020; Ricci et al., 2020; Saúde, 2020; Yang et al., 2020).

Regarding frequency, studies suggest 5 days a week of physical activity, which can be maximised to 5 or 7 days in the confinement period, of these, at least two or 3 days should be for resistance exercise (non-consecutive), 2 days (different) for balance and coordination exercises, three to 5 days for aerobic exercise. Every

day should include mobility training exercises (Jiménez-Pavón et al., 2020; Lakicevic et al., 2020; Ricci et al., 2020; Sepúlveda-Loyola et al., 2020; Yang et al., 2020).

Regarding the volume of physical activity, 150 to 300 min per week is indicated, increasing to 200–400 min in isolation and moderate to vigorous intensity. In vigorous aerobic activities, 75 min a week is sufficient to maintain functionality (Lakicevic et al., 2020; Machado et al., 2020; Ricci et al., 2020; Sepúlveda-Loyola et al., 2020; Yang et al., 2020). However, during the confinement period, moderate intensity is considered ideal for older people in increasing the protective role of exercise. Older people with type 2 diabetes mellitus or chronic rheumatic and musculoskeletal diseases may benefit from direct and well-structured training to maintain mass, muscle strength, functional capacity and adequate blood glucose levels. The exercise program consists of seven warm-up and activation exercises in this specific group, followed by six upper and lower limb resistance exercises, ending with relaxation. It consists of seven exercises that must be performed two to three times a week, combined with aerobic training of the same frequency with a moderate level of perceived fatigue, as recommended by the *American Diabetes Association* (Guadalupe-Grau et al., 2020).

For frail older adults, exercising at home can also be adapted due to greater perception of tiredness and lower physical activity levels. Thus, multicomponent training (e.g. walking with change of pace and direction, step practice, stair climbing, stationary cycling, multidirectional weight lifting and single-legged position) with light intensities with reduced sets and repetitions are recommended (Machado et al., 2020).

Practicing physical activity is also a moment of social interaction that facilitates affective bonds. For this reason, some older adults report no interest in exercising alone at home (Goethals et al., 2020). This lack of motivation might be addressed with adequate communication strategies to maximise positive benefits of physical activity during this period. Digital technologies can also be used to engage seniors and provide exercise interventions at home. However, safety issues related to inadequate supervision and environmental barriers should be better discussed (Machado et al., 2020).

In addition to the recommendations for physical exercise, the need for integrated and articulated services is also highlighted. These services need to meet specific demands of older adults, aiming to monitor, maintain and recover their mobility. Also, the prevention of functional decline in the pandemic and post-pandemic is of great importance (Perracini et al., 2021).

## 5.3 | Means of disseminations of the recommendations to mitigate the decline in older adult's mobility

Digital technologies are used as tools to encourage, guide, and supervise the practice of physical exercises and optimise mobility during the period of contact restriction. Literature covers various

modalities, such as exergames, e-health applications, virtual reality, telerehabilitation programs, video clips and computers. Exergames are an innovative approach to exercise for seniors, which include consoles (Wii, Xbox, and Playstation), rehabilitation technologies (Jintronix software), tablet or smartphone (Vivifrail application), based on wearable sensors (FallSensing, Otago), and virtual reality devices (Box, Rendevar, Sea Hero Quest). This type of intervention projects immersive and attractive environments similar to reality, offering the possibility of playing while practicing physical exercises. Also, exergames have rapidly expanded as a rehabilitation technique, mainly because of their accessibility and low cost (Aubertin-Leheudre & Rolland, 2020; Corregidor-Sánchez et al., 2020).

Likewise, health apps available by mobile technology also serve as promising tools to help seniors stay physically active. Yoga-Down Dog is a mobile app available on the Apple Store that can be used to reduce loneliness and maintain or improve health and independence of older adults. This feature is free to download and allows users to practice various yoga sequences at home, including customised classes for beginners (Banskota et al., 2020).

Corroborating the aforementioned methodologies, integrated virtual reality (VR) exercise is also a promising intervention strategy used in several health areas such as stroke rehabilitation and psychotherapy. This approach exposes individuals to a computer-generated, three-dimensional, multi-sensory virtual environment using a headset or exercise equipment. The use of VR on older adults may prevent falls, increase motor skills, reduce obesity and provide positive effects on coordination, balance and muscle strength (Gao et al., 2020).

Telehealth is the term used to designate health services using information and communication technologies (Gu & Dupre, 2019). This tool was recommended as an efficient solution for the continuity of care during COVID-19 pandemic, mainly due to its low cost, resolvability and convenience (Monaghesh & Hajizadeh, 2020). However, several barriers permeate the broader use of telehealth routinely among older adults, professionals and the health system itself. Many seniors may not even have access to quality Internet, or when they do, they experience difficulties in using mobile devices, whether due to vision, dexterity or cognition (Kalicki et al., 2021). On the contrary, health professionals might be less interested in this type of modality, as they are concerned with the formation of a therapeutic bond, use of techniques in the physical examination and the face-to-face connection. It is also considered the possibility that many professionals cannot use the technologies or face financial difficulties for expenses with telehealth (Zhai, 2020).

Governments and health systems need to expand the use of telehealth during and after COVID-19 pandemic. The consolidation of this approach may occur through the formation of qualified professionals with specific skills in using technologies. Also, the incorporation of telehealth disciplines in the undergraduate and graduate curriculum may be a plausible strategy. Financial incentives are also needed so professionals can adhere to platforms and software that support videoconferencing and improve the technological infrastructure for users, expanding access to the Internet, computers and smartphones (Thomas et al., 2020).

## 5.4 | Gaps in investigation of reduced mobility in older adults during the pandemic

Studies evaluating mobility of older adults in COVID-19 pandemic are lacking, especially using a broader and comprehensive approach. Physical inactivity and its adverse consequences are well documented and may explain the loss of mobility due to contact restriction measures. However, it cannot capture the behaviour of older adults when moving in different life-spaces. Mobility encompasses more complex determinants related to interacting with the environment, social participation, and how services and facilities are accessed and provided (World Health Organisation, 2001).

The lack of studies documenting the influence of other determinants shows fragmentation and absence of an integral vision of mobility. Therefore, it is possible that the proposed interventions, especially based on physical determinants, have little or no impact on older adults whose mobility reduction is more influenced by environmental, psychosocial, cognitive and financial aspects.

Another important factor is the promotion of health and disease prevention in older adults using of digital technologies. An expected percentage of older adults has limited access to these technologies, either because of the late inclusion of these devices in their daily life or lack of financial resources.

In medium and low-income countries such as Brazil, Cambodia, Egypt and India, only 5 to 15% of older adults have access to these technologies, which reinforces the need for strategies that encompass the most diverse contexts and strata to ensure the health and well-being of this age group (Tangcharoensathien et al., 2018).

## 6 | CONCLUSION

The impacts on mobility mapped in this review focus on physical determinants, most problems in the musculoskeletal system. The current literature emphasises the worsening of glycemic control and increased risk of falls, fractures, dependence, reduced functional capacity and the appearance of osteoarticular diseases as adverse consequences of contact restriction measures during the COVID-19 pandemic.

Strong evidence shows that physical activity can optimise mobility. The recommendation of 150–300 min of multicomponent exercise performed five times a week may be unfeasible for older adults with chronic illnesses or geriatric syndromes confined at home and should be adapted according to individual needs. Technologies can be used to motivate, instruct and monitor the practice of physical activity, but their use is still limited in the older adults in low-resource environments.

## 7 | LIMITATIONS

Retrieved literature is mostly based on narrative reviews, editorials and letters to the editor. Although these manuscripts have been published in peer-reviewed journals, they have low level of evidence.

We based the grey literature review on the major organisations that played a crucial role during the pandemic. Still, this review was not exhaustive or comprehensive and may have other relevant documents that we did not include.

## 8 | RESEARCH IMPLICATIONS

We highlight the importance of assessing and monitoring the mobility of older adults during this period of confinement. Not only evaluating physical determinants but also encompassing a broader aspect of mobility, that is, how older adults move through life-spaces that are significant to them, providing opportunities for healthy ageing. No studies were found in this review using instruments that encompassed all the determinants of mobility and its relationship with the measures of contact restriction.

Digital technologies are crucial in times of contact restriction measures. However, they can widen health inequities, especially for older adults in low-income environments. It is expected that gaps identified in this scoping review may help enhance the discussion on how to overcome barriers to performing interventions when contact restriction is a reality.

The nurses must provide person-centred care to older patients by establishing a shared care plan that includes the early identification of mobility limitations and associated risk factors. Nurses also frequently assume the role of case managers and care coordinators and should have the knowledge and skills to implement preventive and rehabilitative approaches to optimise mobility across the continuum of care.

## 9 | IMPLICATIONS FOR PRACTICE

It is expected that gaps identified in this scoping review may help enhance the discussion on how to overcome barriers to performing interventions when contact restriction is a reality.

### AUTHOR CONTRIBUTIONS

MRP, SGBF, CCRS and RCM made contributions to the conception, design, analysis and interpretation of data. SGBF and PPB collected data and the participatory initial analysis of data. SGBF and MRP were involved in drafting the manuscript or revising it critically for important intellectual content. DA, RCM and MRP have given final approval of the version to be published. Each author participated in the work to take public responsibility for appropriate portions of the content.

### ACKNOWLEDGEMENTS

Programs in Gerontology, Faculty of Medical Sciences, Universidade Estadual de Campinas (UNICAMP).

### CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### DATA AVAILABILITY STATEMENT

All data generated or analysed during this study are included in this review article. Any further data and material can be received through contacting the corresponding author.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Felipe, S. G. B., Parreira Batista, P., da Silva, C. C. R., de Melo, R. C., de Assumpção, D., & Perracini, M. R. (2022). Impact of COVID-19 pandemic on mobility of older adults: A scoping review. *International Journal of Older People Nursing*, *00*, e12496. <https://doi.org/10.1111/opn.12496>