BMJ Open

Fear of falling: scoping review and topic analysis protocol

Kamila Kolpashnikova 🅾 , Shital Desai 🅾

ABSTRACT

Introduction Fear of falling (FoF) is a major challenge for the quality of life among older adults. Despite extensive work in previous scoping and systematic reviews on separate domains of FoF and interventions related to FoF, very little attention has been devoted to a comprehensive scoping review mapping the range and scope of this burgeoning area of study, with only a few exceptions. This scoping review aims to provide an overarching review mapping FoF research by identifying main topics, gaps in the literature and potential opportunities for bridging different strains of research on FoF. Such a comprehensive scoping review will allow the subsequent creation of an interdisciplinary theoretical and empirical framework, which may help push forward policy and practice innovations for people living with FoF.

Methods and analysis Following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses—Extension for Scoping Reviews (PRISMA-ScR), seven main databases will be searched from 2000 to the date of the start of the review: Cochrane Database of Systematic Reviews, CINAHL, Embase, MEDLINE, PsycInfo, Scopus and Web of Science. The review will include original research in English, published between 2000 and January 2023. Quality checks will be conducted collegially. Data will be extracted and analysed using PRISMA-ScR charting tools and conventions.

Ethics and dissemination No ethics approval is required for the review. The results will be submitted to a peer-reviewed journal and presented at academic conferences. The outcomes will be disseminated through social media, opinion pieces and science communication platforms to reach a wider audience.

Registration The scoping review was registered with the Open Science Framework (https://osf.io/gyzjq).

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The scoping review will map the extant research on the fear of falling (FoF), contributing to the existing theoretical knowledge on the concept, determinants and outcomes of the FoF.
⇒ Analysing the breadth, range and scope of existing research, the scoping review will help identify gaps and opportunities for bridging interdisciplinary studies across different strains of FoF research.
⇒ Although this review will be comprehensive for studies published in English, the language barriers limit the study from covering the rich literature in other languages, particularly in French and Japanese, where the research on FoF is also burgeoning.
⇒ Given the enormity of the body of research on FoF, the review will only analyse abstracts of the studies in an automated way prior to any manual quality checks. Considering the non-uniform quality of abstracts, some of the studies might not have been appropriately represented by their abstracts and thus can be miscategorised in the topic analysis.

Among older adults who fall, estimated 40%–70% develop FoF as a consequence.[6] Even more concerningly, many older adults who develop FoF have never fallen before.[6–8] Studies show that FoF considerably limits the quality of life among older adults.[3 9–11] Previous research has also shown that FoF affects balance confidence,[12] social participation and engagement in physical activities.[13] All these facts make FoF one of the major impediments to preserving autonomy, independence and the ability to engage in everyday activities in older age.

Rationale

Despite extensive work on FoF,[1 2 14 15] there has not been a holistic inquiry into mapping FoF studies and research interest areas, except for very limited inquiries.[16] Some extensive research has been done on separate domains of FoF with systematic reviews, such as on Parkinson's disease,[17] diabetes,[18] joint arthroplasty,[19] psychosocial responses[20] and common interventions.[21] However, there has never been an overarching review gauging the extent and range of research activity on

Design, York University, Toronto, Ontario, Canada

Correspondence to
Dr Kamila Kolpashnikova;
kamilakolpashnikova@gmail.com

INTRODUCTION

Fear of falling (FoF) is a major barrier to active and independent ageing among older adults.[1–4] According to the Center for Disease Control and Prevention, falls are one of the leading causes of injuries, including fatal injuries, in adults aged 65 years and older. More than one in four older people have a fall in any given year. Only in 2020, 36 508 seniors aged 65 and older died because of falls that could have been prevented. Out of this number, one-third of older adults had one or more falls inside their homes.[5]

FoF, partly because of the enormity of the task (almost a thousand research papers on FoF exist these days).

It is important to identify the range and scope of research on FoF for the following reasons. First, to this day, we lack a comprehensive interdisciplinary theoretical and empirical framework analysing the determinants and outcomes of FoF in a holistic manner. Such a comprehensive framework could be developed given the knowledge of the existing body of research and its range and scope. Thus, a scoping review could push further our theoretical investigations into the concept, determinants and outcomes of FoF.

Apart from mapping the concept with all its empirically tested determinants and outcomes, a scoping review will allow investigating FoF comprehensively as a mediating factor between a host of factors and outcomes. Such analysis would add to our current theoretical and empirical understanding of the mediating effects of FoF on instrumental activities of daily living and the overall quality of life.

A bird eye's view on FoF with the help of a comprehensive scoping review will help expose the gaps in the current research agenda. For example, although previous works have established that visual information plays an important role in risk perception and FoF among older adults,[22–24] the type of visual information in contextual cues affecting FoF has not been investigated sufficiently. The effects of visual information on environmental risk perception have mainly been studied in the context of driving and cycling,[25–28] but less so among community-dwelling older people with FoF.

Considering the world's growing older population, the mandate to understand FoF and its effects on the everyday lives of older adults will only grow in urgency with time, which makes a comprehensive scoping review crucial and critical for further development of this research area.

Objective
The current scoping review aims to map the research of FoF among older adults and identify the range and scope of main topic areas, which will then help identify gaps and opportunities for future research addressing the gaps and bridging the existing research areas. The following main questions will drive this scoping review:

▶ What are the main topics in the literature on the determinants and outcomes of FoF?
▶ What are the gaps in research on (topics?) that can be identified?
▶ What research areas could benefit from more joint and collaborative interdisciplinary research across topics and associated disciplines?

METHODS
Scoping reviews help to produce comprehensive mappings of concepts, research topics and scientific evidence, which systematic reviews cannot achieve because of their narrow focus. Using a scoping review framework[29] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews[30] guidelines, we will search databases of scholarly research with relevant keywords in their titles, particularly searching for the phrase 'fear of falling' in their titles (keyword search: 'fear of falling' (exact phrase)) and subject heading and keyword search on the population (aged 65 and above). This will allow us to narrow down the scoping review to the studies where FoF for older adults is the main focus. The details of the search strategy will be included.

Patient and public involvement
The study is a scoping review that does not involve patients or the public.

Eligibility criteria
We will include studies analysing FoF (both as a determinant and an outcome variable) among older adults aged 65 and above. The sample will include older adults living in nursing homes and assisted living arrangements and those living in their own homes. We will exclude studies where FoF is not treated as the concept in focus (ie, is not an outcome variable or concept in focus in qualitative or methodological studies). We will include all original research types, including articles and conference papers, and exclude letters, editorials or commentaries. Years that will be considered for the search will range from 2000 to 24 January 2023. Only English-language works will be included.

Information sources and search strategy
We will include both quantitative and qualitative studies. No study design or date limits will be imposed. Under the guidance of an experienced Health Sciences librarian, we will conduct searches using both subject headings (ie, MeSH, Emtree) and keywords. We will search the following databases: the Cochrane Database of Systematic Reviews, CINAHL, Embase, MEDLINE, PsycInfo, Scopus and Web of Science. We will first develop a MEDLINE search strategy and peer review it with two authors and the librarian. After the MEDLINE strategy is created, we will adapt subject headings and keyword searches to other databases. Subject headings and keyword searches will also be used to delineate the population of the study. The search strategy for MEDLINE is represented in box 1. The search strategies for other databases can be found in the online supplemental appendix 1.

Study records and selection process
Due to the nature of the scoping review (for identifying overarching topics) and the expected large number of included studies, the selection process will be automated with curation by the authors. The duplicates will be automatically detected by matching the 'author,' 'title' and 'DOI' fields in the search results. We will also exclude entries that do not contain titles or abstracts or contain erroneous data in those fields. Additional automatic detection of duplicate work will be performed using cosine and word2vec similarities in studies' titles. Word2Vec is also

helpful for identifying multiple reports of a single study, but in the case of the topic analysis, this duplication will not bias the results, even if not all duplicates are removed at the cleaning stage. The quality checks on each study as to its inclusion or exclusion are not as critical prior to topic analysis and can be done after. This is because when the aim of the scoping review is the identification of the main overarching topics rather than the systematic review of the identified studies' results. Moreover, some initial work on a novel subarea of FoF can often be of cursory nature, which might bias the results of the review if the goal is to have a more comprehensive review of the range of all studies.

The studies of inadmissible quality, as well as duplicates missed by automation, will be identified in the stage following the topic analysis when the topics will be divided into smaller numbers of works and analysed for inclusion/exclusion by both authors. Where there will be uncertainty, the full texts will be extracted, and both authors will screen the full texts to resolve the disagreement through discussion. The final search results will be reported with a standard PRISMA flow diagram.

Data collection process and data items

The titles and abstracts will be extracted from the studies that will be included in the review. They will constitute the primary data for topic analysis. Automated extraction will be employed as the selected studies tables will already contain the data (titles and abstracts), so there is little room for mistakes in extracting them. For this scoping review, the full texts of the studies will not be extracted. The full texts of the studies will be accessed only when abstracts are of low quality and do not summarise key findings. We will contact the authors of papers where

the full texts would not be available or key findings will require more elaboration.

Each title and abstract will be combined into a combined text for preprocessing. The preprocessing steps will include stopword deletion, stemmatisation and term frequency–inverse document frequency (TF-IDF) vectorisation. The stopword removal stage will include an original procedure based on the state-of-the-art literature employing a mixture of a curated stopword list[31] and automatic identification of uninformative words using the information-theoretic framework (conditional entropy).[32] The stemmatisation will be performed using Python's Spacy package for natural language processing. TF-IDF will transform the texts into feature vectors, which will then be used for topic modelling. Although preprocessing implies that the data will be simplified for the topic analysis, the unprocessed abstracts and titles will be used for summarising the themes within identified topics after the analysis. This way, we will minimise the potential bias from the automation.

Outcomes and prioritisation

Using the Non-negative Matrix Factorization algorithm, we will identify the main topics formed in the literature studying FoF. Thus, the primary outcome will be the main overarching topics identified within the FoF literature. The topic number will be chosen using the shoulder solution on cross-validated coherence scores. The studies within each topic will be further analysed to summarise the results within the topic. As we will choose the studies where FoF is the central concept, we anticipate that most studies will treat it as an outcome variable. However, we will outline the subthemes where FoF was also the central factor analysed in the studies. The results will be illustrated using tables, charts and graphs. A narrative summary will describe the results and explain how the results are related to the study's objectives, which topics are drawing the most attention within the literature, how the topics are connected with each other and what gaps were identified in the literature. In scoping reviews, unlike in systematic reviews, it is not common to report dissemination or outcome reporting biases, particularly if the goal of the scoping review is to identify main topics. This study will only access abstracts and titles. It will not access full texts (with a few exceptions outlined above) or previously published protocols (ie, randomized controlled trial protocols) to assess those biases. Implications and limitations of the study will be discussed. Details on studies included in each topic will be included, following the final (post-topic analysis) review of eligibility for inclusion.

ETHICS AND DISSEMINATION

The ethics approval is not needed for this scoping review. All data will be from publicly available sources and no primary data will be collected. The scoping review is a part of the study 'Co-residing with communities: studying fear

of falling and frailty in older adults' (certificate e2022-204) at York University. The results will be submitted to a peer-reviewed journal and presented at academic conferences. The outcomes will be disseminated through social media, opinion pieces and science communication platforms to reach a wider audience.

ORCID iDs
Kamila Kolpashnikova http://orcid.org/0000-0001-6338-0977
Shital Desai http://orcid.org/0000-0003-1851-0597

REFERENCES

1 Scheffer AC, Schuurmans MJ, van Dijk N, *et al*. Fear of falling: measurement strategy, prevalence, risk factors and consequences among older persons. *Age Ageing* 2008;37:19–24.
2 Zijlstra GAR, van Haastregt JCM, van Eijk JTM, *et al*. Prevalence and correlates of fear of falling, and associated avoidance of activity in the general population of community-living older people. *Age Ageing* 2007;36:304–9.
3 Schoene D, Heller C, Aung YN, *et al*. A systematic review on the influence of fear of falling on quality of life in older people: is there a role for falls? *Clin Interv Aging* 2019;14:701–19.
4 Lavedán A, Viladrosa M, Jürschik P, *et al*. Fear of falling in community-dwelling older adults: a cause of falls, a consequence, or both? *PLoS One* 2018;13:e0194967.
5 Older adult falls - injury facts. Available: https://injuryfacts.nsc.org/home-and-community/safety-topics/older-adult-falls/ [Accessed 20 Jan 2022].
6 Jung D. Fear of falling in older adults: comprehensive review. *Asian Nurs Res (Korean Soc Nurs Sci)* 2008;2:214–22.
7 Friedman SM, Munoz B, West SK, *et al*. Falls and fear of falling: which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. *J Am Geriatr Soc* 2002;50:1329–35.
8 Murphy SL, Dubin JA, Gill TM. The development of fear of falling among community-living older women: predisposing factors and subsequent fall events. *J Gerontol A Biol Sci Med Sci* 2003;58:M943–7.
9 Gottschalk S, König H-H, Schwenk M, *et al*. Mediating factors on the association between fear of falling and health-related quality of life in community-dwelling German older people: a cross-sectional study. *BMC Geriatr* 2020;20:401.
10 van der Vet PCR, Kusen JQ, Rohner-Spengler M, *et al*. Fear of falling, recurrence of falls, and quality of life in patients with a low energy fracture-part II of an observational study. *Medicina (Kaunas)* 2021;57:584.
11 Akosile CO, Igwemmadu CK, Okoye EC, *et al*. Physical activity level, fear of falling and quality of life: a comparison between community-dwelling and assisted-living older adults. *BMC Geriatr* 2021;21:12.
12 Liu T-W, Ng GYF, Ng SSM. Effectiveness of a combination of cognitive behavioral therapy and task-oriented balance training in reducing the fear of falling in patients with chronic stroke: study protocol for a randomized controlled trial. *Trials* 2018;19:168.
13 Okada S, Hirakawa K, Takada Y, *et al*. Relationship between fear of falling and balancing ability during abrupt deceleration in aged women having similar habitual physical activities. *Eur J Appl Physiol* 2001;85:501–6.
14 Yardley L, Beyer N, Hauer K, *et al*. Development and initial validation of the falls efficacy scale-international (FES-I). *Age Ageing* 2005;34:614–9.
15 Cappleman AS, Thiamwong L. Fear of falling assessment and interventions in community-dwelling older adults: a mixed methods case-series. *Clin Gerontol* 2020;43:471–82.
16 MacKay S, Ebert P, Harbidge C, *et al*. Fear of falling in older adults: a scoping review of recent literature. *Can Geriatr J* 2021;24:379–94.
17 Rider JV, Longhurst J, Lekhak N, *et al*. Fear of falling avoidance behavior assessment and intervention in parkinson's disease: a scoping review. *JPRLS* 2022;12:1–17.
18 Hewston P, Deshpande N. Fear of falling and balance confidence in older adults with type 2 diabetes mellitus: a scoping review. *Can J Diabetes* 2018;42:664–70.
19 Chen SK, Voaklander D, Perry D, *et al*. Falls and fear of falling in older adults with total joint arthroplasty: a scoping review. *BMC Musculoskelet Disord* 2019;20:599.
20 Wu SYF, Brown T, Yu M. Older adults' psychosocial responses to a fear of falling: a scoping review to inform occupational therapy practice. *Occup Ther Ment Health* 2020;36:207–43.
21 Whipple MO, Hamel AV, Talley KMC. Fear of falling among community-dwelling older adults: a scoping review to identify effective evidence-based interventions. *Geriatr Nurs* 2018;39:170–7.
22 Tobis JS, Reinsch S, Swanson JM, *et al*. Visual perception dominance of fallers among community-dwelling older adults. *J Am Geriatr Soc* 1985;33:330–3.
23 Lord SR, Webster IW. Visual field dependence in elderly fallers and non-fallers. *Int J Aging Hum Dev* 1990;31:267–77.
24 Ellmers TJ, Cocks AJ, Young WR. Evidence of a link between fall-related anxiety and high-risk patterns of visual search in older adults during adaptive locomotion. *J Gerontol A Biol Sci Med Sci* 2020;75:961–7.
25 Underwood G, Chapman P, Brocklehurst N, *et al*. Visual attention while driving: sequences of eye fixations made by experienced and novice drivers. *Ergonomics* 2003;46:629–46.
26 Underwood G, Crundall D, Chapman P. Driving simulator validation with hazard perception. *Transp Res F: Traffic Psychol Behav* 2011;14:435–46.
27 van Leeuwen PM, Happee R, de Winter JCF. Investigating the effect of a visual search task for simulator-based driver training. In: *Driving Assessment Conference*. University of Iowa, 2013.
28 Dukic T, Broberg T. Older drivers' visual search behaviour at intersections. *Transp Res F: Traffic Psychol Behav* 2012;15:462–70.
29 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8:19–32.
30 Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-scr): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
31 Sarica S, Luo J. Stopwords in technical language processing. *PLOS ONE* 2021;16:e0254937.
32 Gerlach M, Shi H, Amaral LAN. A universal information theoretic approach to the identification of stopwords. *Nat Mach Intell* 2019;1:606–12.