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# BMJ Open Mapping the evidence on assessment of fitness to work at heights: a scoping review protocol

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## ABSTRACT

**Introduction** Falls from height are a leading cause of serious injury and fatality globally. In South Africa, work at heights is regulated by occupational health and safety legislation, which places responsibility on employers to ensure their workers are fit for high-risk work. There is however no formal procedure or consensus on how fitness to work at heights should be assessed. This paper presents an a priori protocol for a scoping review that seeks to identify and map the current evidence base around the assessment of fitness to work at heights. It forms the initial phase of a PhD study aimed at developing an interdisciplinary consensus statement for assessing fitness to work at heights in the South African construction industry.

**Methods and analysis** This scoping review will follow the Joanna Briggs Institute (JBI) scoping review framework and will be guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping reviews (PRISMA-ScR) checklist. An iterative search will be conducted in a selection of multidisciplinary databases including, Proquest Central, PubMed, Scopus, Science Direct, Web of Science, PsychINFO and Google Scholar. Thereafter, searches for grey literature will be performed in Google.com and websites of various national and international agencies, governing bodies and professional organisations with an interest in occupational health and work at heights. Where appropriate, targeted requests for clarification for further information will be undertaken with information sources. A descriptive qualitative content analysis of the results will be conducted and a level of evidence rating will be assigned to each study using the JBI approach. This will allow us to provide some commentary on the rigour of the existing evidence base.

**Ethics and dissemination** Ethics approval for the PhD study was granted by the Research Ethics Committee, Faculty of Health Sciences, University of Pretoria, ethics reference number, 486/2021. Results of the scoping review will be submitted to a scientific journal for publication.

**Trial registration number** This protocol is registered on the Open Science Framework at [osf.io/yd5gw](https://osf.io/yd5gw).

## INTRODUCTION

### Rationale

Falls from height are a leading cause of serious occupational injury and fatality globally.<sup>1–7</sup> In

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This scoping review will be the first to synthesise evidence on the assessment of fitness to work at heights.
- ⇒ Transparency and rigour will be increased through the use of Joanna Briggs Institute (JBI) scoping review methodology and the Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Review guidelines.
- ⇒ Although appraisal of the methodological quality of studies is not a requirement in scoping reviews, a 'level of evidence' rating will be assigned to each source using the JBI approach.
- ⇒ The inclusion of grey literature will increase the richness of evidence, however, access to non-indexed grey literature from the industry may pose a limitation.
- ⇒ This study is limited to papers in the English language, which may exclude relevant evidence.

2013 alone, falls from height accounted for 36.9% of total occupational fatalities in the USA, 31% in the UK and 12% in Australia.<sup>1</sup> In the South African construction industry, falls from height constituted the second highest cause of permanent disability and the third highest cause of fatality between January 2020 and December 2021.<sup>8</sup> Work at heights is thus considered a hazardous or high-risk activity. Work at heights is defined as 'work in any place where, if precautions are not taken, a person could fall a distance liable to cause personal injury'.<sup>9</sup> A person is working at height if they: (1) work above ground/floor level, (2) could fall from an edge, through an opening or fragile surface or (3) could fall from ground level into an opening in a floor or a hole in the ground.<sup>10</sup>

The International Labour Organisation (ILO) Constitution sets forth the principle that employers have a duty to protect workers from sickness, disease and injury arising from their employment.<sup>11</sup> Most countries have a system of laws, regulations and policies that govern health and safety in the workplace,

and many have specific regulations for work at heights. In South Africa, the Construction Regulations of the Occupational Health and Safety Act, 1993<sup>12</sup> requires a medical certificate of fitness for all persons who work at heights.

Worker fitness relates to the individual's capacity to work without risk to their own or others' health and safety.<sup>13 14</sup> Serra *et al*<sup>14</sup> describe worker fitness as a multi-dimensional<sup>14-17</sup> and dynamic concept, incorporating: (1) the worker's physical and mental capacity, (2) the worker's risk in relation to their job demands and the work environment and (3) ethical, economic and legal considerations. Evidence suggests that worker fitness plays a key role in preventing occupational accidents in high-risk occupations.<sup>1 16 18-22</sup> The risk factors for falls from height can be classified as technical, organisational and human.<sup>23</sup> Human risk factors include safety attitude of workers (or low risk awareness),<sup>6 23-28</sup> psychological fitness (especially fear and anxiety),<sup>27 29-37</sup> physical and mental capacities<sup>1 38 39</sup> and drugs and alcohol use.<sup>26 40</sup>

Despite the integral role of fitness assessments in occupational health services and the evidence supporting worker fitness as a preventative measure for accidents in high-risk occupations, an initial search of the literature, produced very little information on the assessment of fitness to work at heights. Indeed, we found a paucity of peer-reviewed evidence on fitness to work in general.<sup>14 16 21</sup> Available literature<sup>14 41-44</sup> mostly addresses baseline pre-employment medical examinations in a variety of industrial settings. We also found some industry-specific guidelines for assessing fitness to work in various high-risk occupations including mining,<sup>45</sup> driving,<sup>46</sup> aviation<sup>41</sup> and firefighting.<sup>47</sup> None of these articles specifically address fitness to work at heights. The literature furthermore raises ethical, economic and legal concerns around fit-for-work examinations,<sup>14-16</sup> with several authors cautioning that work fitness assessments should not discriminate against or exclude individuals from work they could perform safely and productively. For this reason, the current practice in many countries restricts work fitness testing to job-specific examinations.<sup>16</sup>

In South Africa, the approach for assessing fitness to work at heights is currently left to the discretion of the examining occupational health practitioner.<sup>48</sup> These examinations typically take the form of a baseline medical examination, which may not be sufficiently job-specific and may therefore be viewed as discriminatory.<sup>49</sup>

A conspicuous discomfort and even conflict thus emerges between the legal and moral duty of employers and occupational health practitioners, on the one hand, to ensure workers are fit and safe to perform high-risk duties, and on the other hand, to avoid unfairly discriminating against or limiting employment opportunities for these individuals. This conflict needs to be carefully and decisively addressed at the level of the fit-for-work assessment and certification process.

## Review objective

The objective of this scoping review is to identify and map the current evidence base around the assessment of fitness to work at heights. More specifically, the review question is: 'What evidence is available on the assessment of fitness to work at heights?'

As far as the authors are aware, this will be the first systematic synthesis of evidence on the assessment of fitness to work at heights. The evidence obtained in this scoping review will be utilised to develop an interdisciplinary consensus statement for assessing fitness to work at heights in the South African construction industry.

## Previous systematic reviews

An initial search of PROSPERO and the Cochrane Database of Systematic Reviews did not produce any systematic reviews relating to fitness to work at heights and no scoping reviews on this topic were found on Open Science Framework, Figshare or *BMJ Open*. Two systematic reviews addressing fitness to work in general were however found. The first, a 2007 review by Serra *et al*,<sup>14</sup> examines criteria and methods employed by occupational doctors when evaluating fitness for duty. Criteria identified in this study include the determination of the worker's capacity and risk in relation to their job demands and work environment together with ethical, economic and legal considerations. The study found poor clarity around the decision-making process used when judging fitness to work. It concludes that evidence-based guidelines are needed to assess fitness for work. The second study is a 2016 Cochrane review by Schaafsma *et al*<sup>16</sup> that evaluates the effectiveness of pre-employment examinations of job applicants in preventing occupational injury, disease and sick leave compared with no intervention or alternative intervention. This study concludes that (1) health examinations that focus on health risks of particular jobs may be effective, (2) adequately dealing with potential health risks by changing work tasks or physical fitness training may be effective, (3) not allowing people to work in certain jobs may have effects on their health and financial well-being and (4) further research is needed on findings (1), (2) and (3).

Both the above systematic reviews indicate value in fitness to work assessments for high-risk occupations. However, both also highlight the need for further research. This scoping review addresses this need for further research by mapping the evidence base in a specific high-risk work activity, namely work at heights.

## METHODS

### Scoping review design

This scoping review will follow the JBI scoping review framework,<sup>50-52</sup> which builds on the seminal scoping review frameworks of Arksey and O'Malley<sup>53</sup> and Levac *et al*.<sup>54</sup> The JBI framework proposes the following nine stages for scoping reviews:<sup>50</sup>

1. Defining and aligning the review question and objectives.
2. Developing and aligning the inclusion criteria with the review question and objectives.
3. Describing the planned approach to evidence searching, selection, data extraction and presentation of the evidence.
4. Searching for the evidence.
5. Selecting the evidence.
6. Extracting the evidence.
7. Analysis of the evidence.
8. Presentation of the results.
9. Summarising the evidence in relation to the purpose of the review, making conclusions and noting any implications of the findings.

In this protocol, we address stages 1–3. Stages 4–9 will be dealt in the scoping review itself.

In line with the latest JBI guidance,<sup>52 55</sup> we will use the Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR)<sup>56</sup> checklist to guide the reporting of this protocol as well as the reporting of the full review.

### Consultation

Following the scoping review, the data will be presented to a sample of interdisciplinary content experts from occupational medicine, occupational nursing, occupational therapy and construction health and safety for further consultation in the evidence-gathering phase of the PhD study.

### Inclusion criteria

Table 1 sets out the inclusion and exclusion criteria based on JBI's<sup>50</sup> PCC (population, concept, context) mnemonic for question formulation in scoping reviews and defines concepts underpinning the scoping review question.

### Search strategy

We will use JBI's three-step search strategy<sup>50</sup> to locate both peer reviewed and grey literature:

#### Step 1

A initial limited exploratory search of ProQuest Central and Google Scholar databases for relevant peer-reviewed articles has already been done followed by an analysis of text words contained in the article titles and abstracts and of the index terms used to describe the articles.<sup>50</sup> With the assistance of an information specialist, a search strategy was developed by combining descriptors and key words using the Boolean operators AND, OR, NOT, parenthesis and quotation marks.

#### Step 2

The search strategy will be used, with database specific adjustments, to search the databases listed in table 1. Searches for grey literature will follow. To keep the grey literature search manageable and reproducible, we will use search terms consistently between different sources and limit the screening process to the first hundred

results. Additionally, we will report the source name and URL, the search dates and the search terms used. Detailed search strategies for all databases and grey literature sources are presented in online supplemental files 1,2.

#### Step 3

Reference lists of all included sources of evidence will be screened for additional relevant studies and/or information, and where appropriate, targeted requests for clarification or further information will be sent via email to information sources.

The search approach will be iterative, to allow us to adopt additional key words, search terms and sources as the search progresses. A careful audit of the search process will be maintained throughout and documented in a PRISMA<sup>57</sup> flow diagram.

### Evidence selection

Following the search, all identified citations will be uploaded into Mendeley Reference Manager and duplicates will be removed. Evidence screening and selection will be conducted by two independent reviewers (LS and NC) in a two-phase process, namely, (1) a title and abstract review and (2) full-text review. Relevant studies will be eligible if they include the concepts of (1) assessment of fitness to work at heights or in high-risk occupations, and/or (2) fall from height risk factors intrinsic to the worker. Prior to commencement of evidence selection, a pilot study will be conducted on a sample of papers in one database. This will allow further delineation of the review if necessary. Rayyan software<sup>58</sup> will be used during the title and abstract screening phase to collaboratively organise and manage the data between the two reviewers and assist blinding of reviewers. Any articles that are deemed relevant by either of the reviewers will be included in the full-text review. In the second phase (full-text review), the two reviewers will independently assess the full-text articles to determine if they meet the inclusion criteria. To determine inter-rater agreement, Cohen's kappa statistic<sup>59</sup> will be calculated at the full-text review phase. Any discordant articles will be reviewed a second time, and further disagreements about study eligibility will be resolved through discussions with a third reviewer (TB) until full consensus is obtained. Reasons for exclusion of sources of evidence that do not meet the inclusion criteria will be recorded and reported in the scoping review.

### Data extraction/data charting

A data collection tool will be developed and piloted by the two reviewers on a sample of at least two peer-reviewed studies and two grey literature sources and modified as necessary. All adjustments will be detailed in the scoping review. The data collection tool will include, but not be limited to, the following study characteristics: type of document (eg, peer-reviewed or grey literature), publication year, country, industry/location, occupation including comment on type of work at heights (if

**Table 1** Inclusion and exclusion criteria

Inclusion criteria	Rationale for inclusion and exclusion
<i>Population:</i> All workers who work at heights, regardless of age, gender, occupation, location or health status.	Exclusion: the concept of 'old age' as applied to geriatric, non-working populations will be excluded.
<i>Concept:</i> Assessment of fitness to work at heights	Inclusion: Within this concept, we consider the following elements described by Serra <i>et al.</i> <sup>14</sup> <ul style="list-style-type: none"> <li>▶ The worker's physical and mental capacity.</li> <li>▶ The worker's risk in relation to their job demands and work environment.</li> <li>▶ Ethical, economic and legal considerations.</li> </ul> Exclusion: work at height safety risks of a technical or organisational nature, <sup>23</sup> which are not inherent to the individual worker, for example, management failure, environmental risks such as wind or lightning, inadequate personal protective equipment (PPE) and inadequate training of workers.
<i>Context:</i> All countries, all industries, all locations, all occupations	While this review will ultimately inform development of an interdisciplinary consensus statement for assessing fitness to work at heights in the South African construction industry, we have chosen to include evidence from all countries, industries, locations and occupations. The reason for this is twofold: (1) the scope of practice both in occupational safety and medical assessment of fitness to work is driven by core principles and ethics with global application regardless of the country, industry or occupation. Since the key objective of this review is to map the evidence that exists in relation to the assessment of fitness to work at heights, consideration should be given to all evidence that could be applicable. (2) The dearth of information on the topic makes it necessary that we draw from all available experience that could be relevant to our review topic.
<i>Language:</i> English	Only papers retrieved as English-language records (literature database records or full-text articles in English) will be included due to time and resource constraints.
<i>Date range:</i> January 1993 until December 2022	The starting point of 1993 coincides with the promulgation of postdemocracy workplace health and safety laws in South Africa, including the Occupational Health and Safety Act, 1993 <sup>12</sup> and the Compensation for Occupational Injuries and Diseases Act, 1993 <sup>63</sup>
<i>Types of evidence to be included:</i> A wide range of peer-reviewed literature and grey literature <sup>64</sup>	Peer-reviewed evidence: the following databases will be searched: ProQuest Central, PubMed, Scopus, Science Direct, Web of Science, PsychINFO and Google Scholar. Types of evidence to be included: all formal research designs *quantitative, qualitative and mixed-methods studies, review publications, both primary and secondary sources of literature. Types of grey literature will include policy documents, legislation, opinion papers, conference proceedings, magazine/newspaper articles, reports, working papers, etc. The following sources will be consulted: an internet search engine, <a href="https://www.google.com/">https://www.google.com/</a> , the South African Department of Employment and Labour website, websites of relevant professional bodies including South African Society of Occupational Medicine (SASOM), South African Society of Occupational Health Nursing practitioners (SASOHN) and the Institute for Work at Height (IFWH), national and international occupational health and safety websites including, <a href="https://www.ilo.org/">https://www.ilo.org/</a> , <a href="https://www.safeworkaustralia.gov.au">https://www.safeworkaustralia.gov.au</a> , <a href="https://www.ccohs.ca">https://www.ccohs.ca</a> , <a href="https://www.osha.gov">https://www.osha.gov</a> and <a href="https://www.hse.gov.uk">https://www.hse.gov.uk</a> . Consultation with experts and stakeholders will be undertaken in a separate study following this review.

any), physical or mental conditions/risks inherent to the worker, methods and criteria for assessing fitness to work (at heights), role players in determining fitness to work at heights, high-risk occupations, ethical, economic and legal considerations. Two independent reviewers (LS and NC) will extract the data of interest using the data collection tool. This information will then be entered on a spreadsheet in Microsoft Excel. Results will be categorised according to the study characteristics and charted in an iterative process,<sup>50</sup> allowing the reviewers to continually update the spreadsheets should additional information of interest be encountered.

### Data analysis and presentation

Review findings will be summarised from the spreadsheet and a descriptive qualitative content analysis of the results will be conducted. Results will be presented in tabular or diagrammatic form, the contents of which will be refined towards the end of the process as the reviewers gain greater awareness of the details of the included papers. It is however expected that the key characteristics of methods and criteria for assessing fitness to work at heights, as well as ethical, economic and legal considerations, will be presented and described within the results section of the review. Reporting of the scoping review

will be done in accordance with the PRISMA-ScR checklist.<sup>52 57</sup>

### Critical appraisal of individual sources of evidence

An assessment of methodological limitations or risk of bias of the evidence included within a scoping review is generally not performed,<sup>50 51 60</sup> as scoping reviews aim to provide an overview or map of the existing evidence and to summarise key study findings within different domains rather than to evaluate the quality of individual sources.<sup>61</sup> We will however assign a 'level of evidence' rating to each source using the JBI approach.<sup>62</sup> This will allow us to provide some commentary on the relative rigour of the existing evidence base.

### Patient and public involvement

None.

### CONCLUSIONS

This scoping review aims to fill a manifest gap in occupational health literature by identifying and describing what evidence is available in relation to the assessment of worker fitness to work at heights. This information will provide the starting point for a knowledge base in an area where none currently exists, and on which further research can be built. We contend that the information generated in this scoping review will be of interest to a broad range of global industries and occupations that require work at heights. We recognise two notable limitations of this study including, (1) our exclusion of papers in languages other than English, and (2) practical constraints relating to access to non-indexed grey literature. However, we believe the data gathered in this scoping review will provide sufficient evidence to inform subsequent phases of the primary study, which aims to develop an interdisciplinary consensus statement for assessing fitness to work at heights in the South African construction industry.

### ETHICS AND DISSEMINATION

Ethics approval for the PhD study of which this review forms a component, was granted by the Research Ethics Committee, Faculty Health Sciences, University of Pretoria, ethics reference number: 486/2021.

In terms of dissemination, we intend to submit for publication to a scientific journal, the results of the scoping review.

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**Contributors** LS conceptualised the study and is the principal investigator. LS designed the study protocol, developed the search strategy and produced the initial draft of the manuscript. NC and TB provided significant input on all aspects the study including development of the methodology and finalisation of the manuscript. All authors read and approved the final manuscript.

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