# **Review Search Strategy Planning**

## ****1. Topic/Research question****

Write the review topic/ research question in the box below and highlight the key concepts. This should make clear what your review is about to the reader so they understand the condition, population, and outcomes being studied. It may be helpful to structure this research question using [an established framework such as PICO or SPIDER](https://libguides.bodleian.ox.ac.uk/systematic-reviews/methodology).

|  |
| --- |
| Personalized Control Strategies in Wearable Exoskeletons for Lower Limb Rehabilitation: Customizing Control to the User's Needs and Capabilities.  How can personalized control strategies in wearable exoskeletons be designed to adapt to individual user needs and capabilities, and what impact do these personalized strategies have on rehabilitation outcomes for lower limb joint mobility? |

## **2. I**dentify your key concepts and associated keywords

Enter the key concepts highlighted into the top row, and list as many synonyms/alternative terms as you can think of in the column beneath. Remember to include singular/plural terms, acronyms, newer/older terminology, US/UK spellings/terminology and technical terms.

(Add additional columns to detail each concept).

|  |  |  |  |
| --- | --- | --- | --- |
| **Concept 1: Personalized Control Strategies** | **Concept 2: Lower Limb Exoskeletons** | **Concept 3: Lower Limb Rehabilitation** | **Concept 4: Customization Parameters and Adjustable Settings** |
| Personalization, Customization, Adaptive control, Model-based control, User-centered control, Personalized control, Individualized control, User adaptation | Exoskeleton technology, Wearable assistive devices, Robotic exoskeletons, Lower-limb exoskeleton, Exosuit, Powered exoskeleton, Wearable robotics, Exoskeletons, Lower limb exosuit | Mobility, Gait rehabilitation, Functional recovery, Motor control, Individualized therapy, Personalized Rehabilitation, Personalized interventions, Patient-specific rehabilitation | Customization parameters, Customizable settings, Adjustable parameters, Individualized parameters, Custom settings, Adaptive settings, Dynamic settings, Personalized settings, Adjustable control settings, User-specific settings, Custom control parameters |

## ****3. Using search operators and combining your terms****

**Search operators**

Examine your keywords to determine if you can streamline your search by using the techniques below (NB search operators/symbols will vary between the databases: Use the Help functions in each database or see [Search operators quick guide](https://libguides.qub.ac.uk/ld.php?content_id=33390592) to ensure you are using the correct operators):

* Truncation; broadening the search to include various word endings and spellings by using a specific operator, e.g. “therap\*” will return “therapy” and “therapeutic”.
* Wildcards; used to substitute for a single letter or no letter in a word where an operator appears, e.g. “wom#n” will return “woman” and “women”.
* Word proximity; used to identify specific concepts/ terms by defining how close one term must be to another, e.g. “cognitive” adj/2 “therapy” may be used to identify records related to “cognitive behavioural therapy” and “cognitive processing therapy” among others.

## Combining terms

* Equivalent terms or keywords related to the same concept should combined with the **OR** operator to identify relevant works using different terminology, e.g. “teenagers” OR “adolescents”.
* Different concepts should combined with the **AND** operator to narrow specification to records of interest that contain multiple concepts of interest, e.g. “adolescents” AND “depression”.
* Bracketsare used to group related terms together to form a **search string,** e.g.

(“teenagers” OR “adolescents”) AND (“depression” OR “mood disorder”)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Concept 1**  (terms combined with **OR**) | **AND** | **Concept 2**  (terms combined with **OR**) | **AND** | **Concept 3**  (terms combined with **OR**) | **Concept 3**  (terms combined with **OR**) |
| (“Personali\*” OR “Customi\*” OR “Adapt\* control” OR “Model-based control” OR “User-centered control” OR “Personali\* control” OR “Individuali\* control” OR “User adapt\*”) | (“Exoskeleton\*” OR “Wearable assist\* devices” OR “Robotic exoskeleton\*” OR “Lower-limb exoskeleton” OR “Exosuit\*” OR “Powered exoskeleton” OR “Wearable robotics” OR “Exoskeleton\*” OR “Lower limb exosuit”) | (“Mobilit\*” OR “Gait rehabilitation” OR “Functional recovery” OR “Motor control” OR “Individuali\* therapy” OR “Personali\* rehabilitation” OR “Personali\* intervention\*” OR “Patient-specific rehabilitation”) | (“Customi\* parameters” OR “Customi\* settings” OR “Adjustable parameters” OR “Individuali\* parameters” OR “Custom settings” OR “Adapt\* settings” OR “Dynamic settings” OR “Personali\* settings” OR “Adjustable control settings” OR “User-specific settings” OR “Custom control parameters”) |

## ****4. Limits****

Limits may also be applied to the research topic/ question where relevant and there is a valid justification for doing so. Examples of this may be limiting searches to quantitative peer-reviewed publications where quantitative results are reported where a goal of the review is to conduct a meta-analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| **Date range** | **Language** | **Publication/document type** | **Other** |
| From 2020 | English | Journal, Conference, Thesis | Database: Google Scholar, Scopus, ScienceDirect, IEEE Xplore |

## ****5. Piloting the Search Strategy****

To ensure that your search strategy is optimized and captures the most relevant results for researching personalized control strategies in lower-limb exoskeletons, follow these steps:

1. **Test the Search Strategy:** Begin by running the search strategy in the selected databases: Google Scholar, Scopus, PubMed, ScienceDirect, and IEEE Xplore. You may also consider include more comprehensive coverage of specific concepts (e.g., “Exoskeletons,” “Assistive Devices,” or “Personalized Control Strategies”).
2. **Examine the Results:** After running the search:
   * Review the first few pages of results to ensure they are closely related to your research question on personalized control in lower-limb exoskeletons.
   * Note any additional relevant keywords or subject headings that appear frequently in the titles, abstracts, or keywords of useful papers (e.g., "personalized rehabilitation" or "adaptive control").
3. **Adjust the Search Based on Findings:**
   * **Too Many Irrelevant References:**
     + Narrow the search by using more specific terminology or subject headings (e.g., “personalized control strategies” instead of just "control strategies").
     + Use truncation and wildcards in a more targeted way (e.g., "personaliz\*" to capture “personalized,” “personalizing,” and “personalization”).
     + Add an additional specifying concept or filter based on publication type or methodology (e.g., clinical trials, case studies, or reviews on wearable robotics).
     + Apply more search limits (e.g., focusing on studies related to specific rehabilitation outcomes or exoskeleton technologies).
   * **Too Few References:**
     + Widen the search by including more synonyms, related terms, or alternative terminology (e.g., “wearable assistive devices” or “lower-limb prosthesis” in addition to “ankle exoskeleton”).
     + Use more general terms if some key concepts might be too narrowly defined (e.g., “mobility rehabilitation” or “adaptive technologies”).
     + Remove unnecessary limits (e.g., expanding the search to studies published before 2015 or in non-English languages if applicable).
     + Consider removing some more specific concepts to cast a wider net (e.g., starting with just “personalized control” and “exoskeleton” and gradually narrowing it down).
4. **Refine and Repeat:** After adjusting the strategy based on pilot results, test it again in multiple databases including IEEE Xplore to ensure consistency and relevancy. Make sure that the strategy works across different platforms and consistently provides a manageable number of high-quality results that are relevant to personalized control strategies in lower-limb exoskeletons and rehabilitation.

## **6. Adapting your search strategy**

Once satisfied with the core search strategy based on initial searches, this should be modified for each database, using alternative subject headings and search operators that apply to each specific database being searched (see example [here](https://libguides.reading.ac.uk/ld.php?content_id=34596150)).