PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Theories, models and frameworks to understand barriers to the provision of mobility assistive technologies: A scoping review
AUTHORS	Aldawood, Asma; Hind, Daniel; Rushton, Simon; Field, Becky

VERSION 1 – REVIEW

REVIEWER	Jiménez-Arberas, Estíbaliz University of Oviedo, Faculty Padre Osso
REVIEW RETURNED	06-Nov-2023

GENERAL COMMENTS	Thanks to the authors for this manuscript, it is very interesting for the scientific community and for the measurement of AT results. Regarding the keywords, some vital ones are missing for this study such as assistive technology, mobility, framework... you should think about these since it is important for your manuscript As for the abstract, I would not use acronyms, I think the conclusions can be improved. Introduction:ICF terminology such as participation restriction and activity limitation should be included. Lines 7-9 should be redrafted and consistent with independence and occupational performance. It is not clear in line 12 the classification used and the reason for choosing these products and not others, it may be possible to include the ISO 2023 standard. There should be in this part a review of the literature regarding AT frameworks. It is surprising that, for example, Matching Person and Technology does not appear in the review, or for example that of Lauer, Longeneck and Smith on abandonment or interruption of AT. Or others from specific areas such as education, such as SETT or WATI, when these devices are used in an area of use I think that in table 4 the format should be looked at, even in table 3 and 4 make figures so that reading is easier and not so tedious. On page 12, 13 and 14, it is interesting but theoretical aspects must be reviewed and many of these are related to the lack of review of the models in the introduction. For example, personal factors are not coded in the ICF but other models such as the MPT have addressed them. Proposition 3 talks about the ICF and the HAAT, but there are other models and even specific evaluation tools, something that is not contemplated throughout the document and is interesting. For example, in numbers four and five, there is little coverage of the cultural aspect or even pathologies. In proposition 6, GATE, RESNA or WHO do not appear directly. Everything mentioned above should be found in the discussion. No relevant works appear in the bibliography, such as by Thais Pousada, who even wrote his Thesis on wheelchairs in

	neuromuscular disease, but neither do other works that have addressed this topic.

REVIEWER	Borg, Johan Dalarna University School of Health and Welfare
REVIEW RETURNED	22-Dec-2023

GENERAL COMMENTS	Thank you for the opportunity to review this interesting and timely manuscript, reporting a scoping review of theories, models and frameworks to understand barriers to the provision of mobility assistive products. The manuscript has a great potential to become an important contribution to the field and spur theoretical advances. The manuscript is well-structured, and the language is clear and concise. With an intention to further improve the quality of the manuscript, I would like to see that the authors address the following concerns. Given that the International Organization for Standardization (ISO) and the World Health Organization (WHO) both use 'assistive products' it would be beneficial if the manuscript would conform to the global terminology in this field, replacing terms such as "mobility assistive technologies" (sometimes with and sometimes without a hyphen) "mobility devices" with "mobility assistive products" or "assistive products for mobility". As access is a central concept, it needs to be defined. WHO and UNICEF has defined access in the realm of assistive technology in their Global Report on Assistive Technology, which was published in 2022. This report is also a more appropriate and contemporary reference for some of the statements in the Introduction than some of the current ones (e.g., [9, 14, 17]). The Global Report can also be used to enrich the Introduction and to discuss the findings and the synthetic model. Its recommendations and actions can also be used to discuss identified knowledge gaps. The aim in the Abstract and the Introduction need to be aligned. Moreover, the aim should also mention something about identifying knowledge gaps. Placing the research question under 'Eligibility criteria' should be reconsidered. Moreover, the research question does not cover identification of specific determinants or knowledge gaps, and thus need to be complemented with additional questions. The search strategy is comprehensively described in an appendix, but it is easy to misunderstand the search strategy from the information in Table 1, which has a very limited set of search terms without telling it. This should be clarified in the text and the table. Despite the elaborate list of search terms, it misses important terms such as "service delivery" or "deliver*" and "service*". It also misses "assistive product*", "mobility product*", "older person*", "older adult*", etc. If a new search using additional search terms is not conducted, this limitation should be described in the discussion of study limitations, which is currently missing. As per my understanding of Medline and Embase, Embase nowadays contain all articles that can be found in Medline, which seems to be supported by the hits from the searches. It was therefore unnecessary to conduct searches in Medline. Rather, as assistive technology concerns multiple disciplines, Scopus should

	have been searched. Another database that would have been expected is AMED, but as it is not very comprehensive it would be acceptable to exclude it from a scoping review. My first recommendation would be to complement the search strategy with a search in Scopus. If this is not done, this flaw in the search strategy should be explained in the discussion of limitations of the study. As the exclusion criteria in table 2 are just mirroring the inclusion criteria without adding any new criteria, they can be omitted. In addition, the number 20 in the rationale for the last criterion is incorrect. In the study selection it is written that the initial screening was conducted by one author. It is therefore unclear what discrepancies refer to in the last part of the same sentence. Moreover, it is not clear if the propositions of the identified TMFs are those that were reported in the included articles or if they collected from other materials presenting the TMFs. This needs to be clarified. As 'access' is not defined it is not clear why certain articles were included. For example, why are articles on environmental barriers to participation included in a scoping review on barriers to access? It would facilitate orientation for the readers if the studies would be listed in alphabetic order of the authors. The CFIR framework in table 4 is not the latest one, which was published in November 2022. The analysis should either be redone in accordance with the new framework, or the framework used should be clearly described and this limitation should be acknowledged. Moreover, according to my understanding, the barriers not mapped to CFIR seem to be fitting the construct II.A Needs & Resources…, as it includes barriers and facilitators of those served. It is unclear why effect sizes of 12% and smaller should be mentioned. What are the practical implications of factors with such effect sizes? Figure 2 offers a simple and clear synthesis of the considered theories. Considering theories of behavior change, and given that personal factors also influence decisions to seek services, as well as mobility and human development, the model may be overly simplistic and need a small revision. It may also be better to reorder 4 and 5 for pedagogical reasons.

VERSION 1 – AUTHOR RESPONSE

Reviewer #1

	Reviewers Comment	How It's Been Addressed	Location in Manuscript
1.	Regarding the keywords, some vital ones are missing for this study such as assistive technology, mobility, framework... you should think about these since it is important for your manuscript	We acknowledge the necessity of including 'Assistive Technology', 'Mobility', 'Barriers', 'Framework', and 'Scoping Review' in our manuscript. These were not available for selection in the system; therefore, we have requested the editorial team to make these additions. However, they are still not valid, but we were able to add these keywords: 'Self-Help Devices', 'Disabled Persons', 'Review'.	[page 1]
2.	As for the abstract, I would not use acronyms, I think the conclusions can be improved.	We have removed all acronyms from the abstract. We've aimed for clarity and conciseness in reflecting the study's conclusion in the abstract, mindful not to exceed the word limit	Abstract [page 2]
3.	Introduction: ICF terminology such as participation restriction and activity limitation should be included. Lines 7-9 should be redrafted and consistent with independence and occupational performance.	The introduction has been updated to incorporate ICF terminology, ensuring that the terms 'participation restriction' and 'activity limitation' are used appropriately. It has been redrafted to reflect the concepts of independence and occupational performance, providing clarity and consistency with the established terminology in the field.	Introduction, Paragraph 1 [page 4]
4.	It is not clear in line 12 the classification used and the reason for choosing these products and not others, it may be possible to include the ISO 2023 standard.	We have revised and used the ISO 2022 standard for defining assistive products, and including products mentioned in the ISO standard. We define 'assistive technology' and 'assistive products' in accordance with WHO and ISO definitions.	Introduction, paragraph 1, last 4 sentences. [page 4]

5.	There should be in this part a review of the literature regarding AT frameworks. It is surprising that, for example, Matching Person and Technology does not appear in the review, or for example that of Lauer, Longeneck and Smith on abandonment or interruption of AT. Or others from specific areas such as education, such as SETT or WATI, when these devices are used in an area of use.	• We acknowledge the importance of certain theories, models and frameworks (TMFs) well-known in the field. We initially did not include these TMFs because our literature search did not yield studies applying these models directly to the issue of access to AT. However, we have re-run the literature search with a revised strategy to include the MPT model and the 'Abandonment of AT' model (updated in Appendix 2). We found that these specific models are not discussed in the context of barriers to AT access. However, upon conducting an extensive manual search, we identified one eligible article that uses the MPT model, which we have now included in our analysis accordingly. • Regarding the inclusion of SETT or WATI, which are primarily evaluative tools used within educational contexts, we adhered to a precise eligibility criterion distinct from the evaluative nature of SETT and WATI. As outlined in Table 2 (page 5) of our manuscript, our focus was on publications that report on the barriers to the provision of MATs and include at least one TMF. We have now revised the introduction to clearly define 'models,' 'theories,' and 'frameworks' with examples, and we have also reviewed these theory models and frameworks.	The MPT model is included on the analysis page [9-11] Introduction, paragraph 3-5, [page 4]

6.	I think that in table 4 the format should be looked at, even in table 3 and 4 make figures so that reading is easier and not so tedious.	Tables 4 and 3 have been converted into figures.	Figure [2 and 3]
7.	On page 12, 13 and 14, it is interesting but theoretical aspects must be reviewed and many of these are related to the lack of review of the models in the introduction. For example, personal factors are not coded in the ICF but other models such as the MPT have addressed them.	• We have now revised the introduction to review these TMFs. • The MPT model, as mentioned in [comment 5], has been incorporated within the theoretical synthesis on pages 9-11	• Introduction, paragraph 3-5, [page 4] • TMF Synthesis [page 9-11]
8.	Proposition 3 talks about the ICF and the HAAT, but there are other models and even specific evaluation tools, something that is not contemplated throughout the document and is interesting. For example, in numbers four and five, there is little coverage of the cultural aspect or even pathologies. In proposition 6, GATE, RESNA or WHO do not appear directly. Everything mentioned above should be found in the discussion.	• This point was addressed in [comment 5] regarding the eligibility of TMF. In addition, by including the MPT model, we enhance these propositions that discuss personal factors (Proposition 8) and environmental factors (social, cultural, physical) (Proposition 5). • The focus of TMF synthesis on pages 9-12 is on the theory models and frameworks as reported by the articles included in our review. Organisations such as the UN, and WHO , have been thoughtfully considered and addressed within the discussion and introduction section.	• TMF Synthesis [pages 9-11] • Discussion paragraph 4, [page13]

9.	No relevant works appear in the bibliography, such as by Thais Pousada, who even wrote his Thesis on wheelchairs in neuromuscular disease, but neither do other works that have addressed this topic	The eligibility criteria of studies included in the review should report on barriers to MAT access and mention one TMF. We also aimed to include peer-reviewed papers; therefore, we excluded grey literature. We have updated the bibliography in the introduction and discussion sections to include more contemporary sources, such as the 'Global Report on Assistive Technology (2022)' by WHO and UNICEF, which offers a contemporary overview of the state of assistive technologies.	• Method: Information sources and Searches [page 6] • Introduction paragraph 2, [page 4] • Discussion paragraph 4, [page13]

Reviewer#2

	Reviewers Comment	How It's Been Addressed	Location in Manuscript
10	Given that the International Organization for Standardization (ISO) and the World Health Organization (WHO) both use ‘assistive products’ it would be beneficial if the manuscript would conform to the global terminology in this field, replacing terms such as “mobility assistive technologies” (sometimes with and sometimes without a hyphen) “mobility devices” with “mobility assistive products” or “assistive products for mobility”.	We have replaced the term 'devices' with 'products' to maintain consistency with the standardised language. We have carefully considered aligning our manuscript with the global terminology standards set forth by the ISO and WHO. We revised and clearly defined 'assistive technology' and 'assistive products' in accordance with WHO and ISO definitions. We adopt the term 'mobility assistive technologies' as an overarching concept that includes 'assistive products for mobility,' along with the associated systems and services. This aligns with the global terminology endorsed by the WHO, where an assistive product is defined as any external product designed to support an individual's functioning. This reflects the scope of our scoping review and is rooted in our findings that the efficacy of assistive products for mobility is often significantly enhanced by their comprehensive provision, which includes systems and services designed to support their use	Introduction, paragraph 1, last 4 sentences. [page 4]

11	As access is a central concept, it needs to be defined. WHO and UNICEF has defined access in the realm of assistive technology in their Global Report on Assistive Technology, which was published in 2022. This report is also a more appropriate and contemporary reference for some of the statements in the Introduction than some of the current ones (e.g., [9, 14, 17]). The Global Report can also be used to enrich the Introduction and to discuss the findings and the synthetic model. Its recommendations and actions can also be used to discuss identified knowledge gaps.	Done, and we have now defined the concept of access in our manuscript as per the WHO and UNICEF's Global Report on Assistive Technology (2022). We have also incorporated this report as a reference to strengthen and update the statements in the Introduction. Furthermore, the report has been used to enhance the discussion of our findings	• Introduction, paragraph 2, last 3 sentences, [page 4] • ·Discussion paragraph 4, [page 13]
12	The aim in the Abstract and the Introduction need to be aligned. Moreover, the aim should also mention something about identifying knowledge gaps.	Done.	Abstract [page 2], Introduction, last sentence [page 4]
13	Placing the research question under 'Eligibility criteria' should be reconsidered. Moreover, the research question does not cover identification of specific determinants or knowledge gaps, and thus need to be complemented with additional questions.	Done. We have moved the research questions into the 'Methods' section, and we have expanded our research question to explicitly include the identification of specific determinants and knowledge gaps	Method [page 5]
14	The search strategy is comprehensively described in an appendix, but it is easy to misunderstand the search strategy from the information in Table 1, which has a very limited set of search terms without telling it. This should be clarified in the text and the table.	We have removed the search strategy from Table 1 to avoid any confusion and have revised the table to focus solely on the application of the BeHEMoTH framework in defining search concepts	Table 1 [page5]

15	Despite the elaborate list of search terms, it misses important terms such as “service delivery” or “deliver*” and “service*”. It also misses “assistive product*”, “mobility product*”, “older person*”, “older adult*”, etc. If a new search using additional search terms is not conducted, this limitation should be described in the discussion of study limitations, which is currently missing.	We have accordingly reviewed our search strategy. We updated our search to include the terms 'assistive product*' and 'mobility product*’[Appendix 2], no additional eligible articles were found. , We used terms 'Geriatrics/' and 'Elder*.ti,ab.' to capture the scope of older individuals. We recognise that the omission of other specific search terms such as ‘older person*’ ‘older adult*’ ‘service delivery,' 'deliver*,' and 'service*' may present a limitation, which is outlined in the discussion section. However, we employed a comprehensive search strategy developed with an information specialist to identify relevant publications aimed to optimise both sensitivity and specificity, ensuring that the most relevant articles were retrieved without having to sort through an excessive number of irrelevant ones.	• Appendix 2 • Discussion, paragraph 3 [page 13]
16	As per my understanding of Medline and Embase, Embase nowadays contain all articles that can be found in Medline, which seems to be supported by the hits from the searches. It was therefore unnecessary to conduct searches in Medline. Rather, as assistive technology concerns multiple disciplines, Scopus should have been searched. Another database that would have been expected is AMED, but as it is not very comprehensive it would be acceptable to exclude it from a scoping review. My first recommendation would be to complement the search strategy with a search in Scopus. If this is not done, this flaw in the search strategy should be explained in the discussion of limitations of the study.	Thank you for your insight. We have now complemented the search strategy with a search in Scopus and have updated the method and analysis accordingly. One article was included accordingly.	

17	As the exclusion criteria in table 2 are just mirroring the inclusion criteria without adding any new criteria, they can be omitted. In addition, the number 20 in the rationale for the last criterion is incorrect.	Regarding the exclusion criteria in Table 2, we have chosen to retain them, as we believe this approach provides greater clarity and transparency in our methodology. We appreciate your pointing out the error with the number "20," and it has now been corrected to "23" in the revised manuscript.	Table 2, page [5-6]
18	In the study selection it is written that the initial screening was conducted by one author. It is therefore unclear what discrepancies refer to in the last part of the same sentence.	We have revised the 'Study Selection' section of the manuscript to provide a clearer explanation of the process.	Study selection, sentences 2 and 3 page [6]
19	Moreover, it is not clear if the propositions of the identified TMFs are those that were reported in the included articles or if they collected from other materials presenting the TMFs. This needs to be clarified.	We have clarified this in the revised manuscript, by adding “We extracted theoretical propositions from the TMFs, as discussed in the articles included in our review. In instances in which these articles did not provide a comprehensive explanation of TMFs, such as Gibson’s affordances theory, the IMPACT^2 model, and the HAAT model, we referred to the foundational sources. The sources cited within the included articles are original materials in which TMFs were first introduced or explained thoroughly. This ensured that our understanding and coverage of TMFs was comprehensive, especially when the application of these TMFs in the reviewed articles lacked depth. Although these foundational sources were not directly included in our review as they did not meet our inclusion criteria, they were consulted for additional insights”	Data charting process, page [6-7]

20	As ‘access’ is not defined it is not clear why certain articles were included. For example, why are articles on environmental barriers to participation included in a scoping review on barriers to access?	We have now included a clear definition of 'access' in the Introduction section of the revised manuscript, demonstrating that environmental factors are inherently related to the access and utilisation of AT. Additionally, our criteria for inclusion were publications that report on the barriers to access, which must include at least one TMF [Table 2]. In several studies we reviewed, the primary aim might not have been directly related to 'access.' However, these studies reported on barriers to access, which aligns with the scope of our review.	Introduction, paragraph 2, [page 4]
21	would facilitate orientation for the readers if the studies would be listed in alphabetic order of the authors.	Our references are formatted as per the BMJ Open guidelines, which require that citations be numbered sequentially in the order in which they appear in the text and correspond to the numbered list of references at the end of the article.	
22	The CFIR framework in table 4 is not the latest one, which was published in November 2022. The analysis should either be redone in accordance with the new framework, or the framework used should be clearly described and this limitation should be acknowledged. Moreover, according to my understanding, the barriers not mapped to CFIR seem to be fitting the construct II.A Needs & Resources…, as it includes barriers and facilitators of those served.	Done. Thank you for your insightful comment regarding the use of the CFIR framework, previously presented in Table 4 and now displayed in Figure 3. In response to your suggestion, we have updated our analysis to align with the latest CFIR framework. Also, we have changed the previously unmapped barriers in light of the updated CFIR constructs. These barriers are now appropriately mapped to the 'Innovation Receipt' construct. Additionally, based on feedback from Reviewer 1, we have transformed the original table into a Figure. This change enhances understanding and makes it easier for readers.	Barriers synthesised using CFIR, **Figure 3**, and paragraph page [8]
23	It is unclear why effect sizes of 12% and smaller should be mentioned. What are the practical implications of factors with such effect sizes?	To avoid any confusion, we have deleted this sentence. These are effect sizes observed in meta-analyses of the observed effects of implementation strategies. This means that they represent improvements in processes across a range of settings and conditions. The practical upshot is that there are good theoretical and empirical reasons to think that, when delivered properly,	Discussion, last paragraph [page 13]

		these implementation strategies can remove barriers regardless of the setting.	
24	Figure 2 offers a simple and clear synthesis of the considered theories. Considering theories of behavior change, and given that personal factors also influence decisions to seek services, as well as mobility and human development, the model may be overly simplistic and need a small revision. It may also be better to reorder 4 and 5 for pedagogical reasons.	We have adjusted the figure to align the representation of personal factors affecting mobility and the use of services with the narrative presented in the text, as outlined in Propositions 2 and 8. Additionally, we have reordered items 4 and 5 to better align with the text presented.	Figure 4

VERSION 2 – REVIEW

REVIEWER	Jiménez-Arberas, Estíbaliz University of Oviedo, Faculty Padre Osso
REVIEW RETURNED	19-Mar-2024

GENERAL COMMENTS	Thank you for making the modifications indicated, however, there are some points that still need to be addressed in order to consider publication of the manuscript. Despite including the MPT, and derived from the authors' response of "We found that these specific models are not discussed in the context of barriers to AT access". I still believe that this model should appear even in the discussion. I understand that when the authors made the review the time frame was June 2023, however a year has passed and it has been possible to publish articles of interest so that the review is up to date. Figures 2, 3 and 4 Nothing is visible. Page 72 MPT reference, I think it should be included that the MPT was created in consideration of the ICF. The discussion should answer the objective "identifies the determinants of access, and highlights the gaps in current knowledge" there is little debate on the gaps... which are many starting from the fact that for example the ICF is widely used but does not include personal factors, there is little debate among the factors... figures two and three... should be addressed, which model should be used????

REVIEWER	Borg, Johan Dalarna University School of Health and Welfare
REVIEW RETURNED	05-Mar-2024

GENERAL COMMENTS	Although not all review comments were addressed, the most critical changes have been made satisfactorily.

VERSION 2 – AUTHOR RESPONSE

First, we have included a discussion of the Matching Person and Technology (MPT) model and its relevance to our review in the Discussion section. Although the MPT model does not explicitly discuss barriers to AT access, we acknowledge its importance in considering the interaction between personal, technological, and environmental factors that influence successful AT adoption [Location in Manuscript: Discussion section].

Second, we have updated our search to include studies published up to March 20, 2024, to ensure that our review is as current as possible. A new eligible study has been incorporated into the review.

Third, we have reviewed the figures in the manuscript to ensure their clarity and visibility; they are correctly highlighted within the text. In accordance with the journal's guidelines, these should be presented separately from the manuscript. They can be found on pages 23, 24, and 25 of the submission file. However, one of the figures—'Theories, Models, Frameworks, and Their Purpose of

Application in Eligible Studies'—has been moved to the supplemental materials, as per the journal guidelines, which limit the number of tables and figures to five. This figure contains information that is already highlighted in the text.

Fourth, we have added a note on page 72 indicating that the MPT model was developed with consideration of the ICF framework and have included the corresponding reference [Location in Manuscript: TMF Synthesis, Proposition 3].

Finally, we have expanded our discussion of knowledge gaps to provide more detail on the specific areas identified in our gaps analysis. We have also addressed the reviewer's comment about the lack of personal factors in the ICF framework and the need for future research to consider the most appropriate TMF(s) based on the specific research questions and contexts [Location in Manuscript: Discussion section].

We hope that these changes adequately address the reviewer's concerns and improve the overall quality of our manuscript. Thank you for your continued consideration of our work.

VERSION 3 – REVIEW

REVIEWER	Jiménez-Arberas, Estíbaliz University of Oviedo, Faculty Padre Osso
REVIEW RETURNED	21-Apr-2024

GENERAL COMMENTS	Thank you for allowing me to make the present review, I think it is a very interesting and necessary study at the present time. The manuscript has improved a lot since the last version sent, the modifications and additions made are appreciated. I also believe that the review follows a correct methodological process and the steps required by PRISMA. I do not notice any models related to the educational domain such as SETT and WATI, why were they not included? Educational mobility support products and their barriers should be included. I understand that in the review itself it is not included but in the discussion the ATOMS model of disruption in the use of ATs should be included for discussion as it includes some interesting factors to discuss in this manuscript.

VERSION 3 – AUTHOR RESPONSE

In our first response letter, we addressed the issue raised in the initial review comments regarding not including the SETT, WATI, and interruption of AT use (ATOMS). These were raised again in the latest review comments. While we recognise the significance of various theories, models, and frameworks (TMFs) well-known in the field, our literature search did not yield studies that directly applied these models to the specific issue of access to Mobility Assistive Technologies (MATs), which is the focus of our scoping review. Our systematic search was designed to capture a wide range of TMFs without focusing on one particular framework. However, we incorporated 'SETT', 'WATI', and 'abandonment' or 'discontinuance' as search terms, as specified in Appendix 2, with the intent to capture literature

that applies these theoretical models to barriers in accessing Mobility Assistive Technologies (MATs). Nevertheless, these terms yielded no results in the databases we explored. Only Medline retrieved one article using the HAAT model, which was already included in our review. While SETT and WATI are important to the field of assistive technology, specifically in the [educational context] for decision-making, they may not have been reported within the context of barriers to MAT access . Therefore, we have updated our discussion to acknowledge the importance of other theoretical models that our review may not have captured, and we suggest further research in the discussion section [Location in Manuscript: Discussion section].
2. We also updated the discussion section to address the issue of interruption or abandonment of assistive technologies (AT), as the factors identified in our review relate to the abandonment of AT, as discussed by Lauer et al. in the ATOMS Project [Location in Manuscript: Discussion section].

We hope that these changes adequately address the reviewer's concerns and improve the overall quality of our manuscript. Thank you for your continued consideration of our work.