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# Domains of wheelchair users' socio-emotional experiences: Design insights from a scoping review

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ABSTRACT

*Background:* Physical accessibility is not the only concern for wheelchair users (WUs); they also face barriers to social presence, such as challenges in social engagement and negative stereotypes. Identifying key domains in the literature that impact their social and emotional experiences is essential to addressing these issues.
*Objective:* This scoping review sought to explore the key domains of WUs' socio-emotional experiences, as a foundation for providing design-oriented insights to enhance their social presence.
*Methods:* A literature search was conducted using the Web of Science, PubMed, Scopus, and PsycINFO databases, along with a manual search of three relevant journals. Articles in English, based on original empirical studies that focused on the socio-emotional experiences of adult WUs (>18), were included.
*Results:* Of the 48 articles included, most were from Canada (n = 11), Sweden (n = 9), the U.S. (n = 7), and the U.K. (n = 6), with limited studies from other countries. Among the six domains explored, Independence & Autonomy (26 %) was the most frequently reported, while Self-Identity & Body Image (9 %) and Social Stigma & Discrimination (5 %) were the least. Three interconnected themes emerged to guide design insights: Theme I – Foundations: Autonomy & Control, Theme II – Connections: Social Participation & Support, and Theme III – Reflection: Self- & Social-Identity.
*Conclusion:* While independence and agency are key concerns, little research has focused on perceptual issues like self- and social-identity, often highlighted in the media. This area can be refined by recognizing the crucial role of design in aesthetically shaping WUs' social representation in public settings.

## 1. Introduction

While confronting physical obstacles such as inaccessible settings,[1,2] unequal access to healthcare,[3] and inadequate transportation options,[4] wheelchair users (WUs) also deal with considerable social difficulties. These social experiences often range from feelings of being treated as second-class citizens,[5] and facing discrimination,[6] to experiencing loneliness and social isolation.[7,8] In turn, this can trigger emotional distress, damage self-perception,[9–11] and further intensify social isolation.[12,13] In this context, the interplay between social isolation and emotional distress creates a detrimental positive feedback loop, where emotional challenges deepen isolation, which in turn exacerbates emotional difficulties,[14] affecting their quality of life (QoL). Breaking this cycle requires collective efforts from disability experts in both policy and practice. However, it is essential to first gain a clear understanding of the range of socio-emotional difficulties experienced by WUs. By mapping these domains, this understanding enables experts to develop effective interventions. While interventions can range from broad policy reforms to targeted design innovations, this study focuses on the latter, discussing design-oriented recommendations that directly impact the social presence—defined as the extent to which individuals are seen, acknowledged, and engaged in social settings, shaping their inclusion[15]—and experiences of WUs. This approach uncovers underlying challenges and reveals hidden insights, enabling the development of creative and effective solutions.[16]

In this study, we aim to map out the range of explored domains in WUs' socio-emotional experiences and accordingly discuss the design insights. Specifically, it seeks to answer two research questions: What

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are the most frequently explored domains of WUs' socio-emotional experiences? To achieve this, we conduct a scoping review of scholarly studies that focus on the experiences of WUs as outlined above. We then discuss the design insights to assist designers and disability researchers. It is worth emphasizing that the research question focuses on the frequency of exploration of socio-emotional domains within the literature, rather than the actual prevalence of these experiences among wheelchair users. While a higher volume of publications may indicate greater scholarly attention, it does not necessarily reflect the commonality or frequency of these experiences in the lived reality of WUs.

This study aligns with the rights enshrined in the United Nations Convention on the Rights of Persons with Disabilities (CRPD), highlighted at the 17th Session of the Conference of States Parties (COSP17) in June 2024 in New York.[17] The CRPD emphasizes inclusivity, ensuring that individuals with disabilities have their dignity respected, their voices heard, and are actively involved in decisions affecting their lives, advocating for rights such as freedom of expression, education, healthcare, and employment. The contributions of this study are as follows.

- Mapping the socio-emotional experiences provides a comprehensive overview of existing research, identifying the scope and range of evidence available.
- The findings also enable researchers in disability studies and design for care to find the gaps in developing relevant recommendations for addressing the challenges associated with socio-emotional experience in using mobility aids (MAs).

The remaining sections of the paper are structured as follows: Section 2 outlines the methodology we developed to identify the literature that concerns the socio-emotional experiences of WUs. In Section 3, we report the results and provide the analysis of the data. Section 4 is dedicated to interpreting the collected data and discussing opportunities to optimize the social experiences of WUs. Finally, we summarize our findings in a concise conclusion and provide suggestions for further study.

## 2. Methods

### 2.1. Scoping review guideline

A scoping review was conducted by an interdisciplinary research team (disability studies, sustainability studies, and inclusive design) in the area of social inclusion. This review follows the Joanna Briggs Institute (JBI) methodology for the scoping methods and adheres to the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).[18] Protocol registration was done in Open Science Framework.[19] This study is a review article; it does not require approval from the Institute Review Board (IRB). We performed a scoping review using a scientific methodology.

### 2.2. Information sources and search strategy

For data gathering, we used four search engines, Web of Science, PubMed, Scopus, and PsycINFO with every possible keyword to consider population (adults), intervention (consistent users of wheelchairs), and outputs (social and psychological experience of using wheelchairs). These databases were selected for their accessibility, thematic relevance, and coverage of international publications. We limited our search to publications from 2000 onward to capture advancements in best care practices for WUs over the past two decades. Search strategies were reviewed on February 1, 2023, and updated on May 28, 2024. Given the frequency of relevant qualitative study publications, we hand-searched the following three journals for relevant articles up to May 2024: (1) Disability and Rehabilitation, (2) Assistive Technology, and (3) Scandinavian Journal of Occupational Therapy. Using Boolean logic, the key concepts and terms were combined with "OR," "AND," and "NOT" to ensure comprehensive results, including all relevant subheadings.[20] See Appendix A for the detailed search strategy. Search terms were developed through thesauri-based expansion within each academic database, input from the expert panel. To prevent every potential bias, a librarian at Concordia University, an expert in the field of health and medicine, monitored our protocols of search strategies and continuously checked the steps. The final studies were selected in two phases: title and abstract screening, followed by full-text review, conducted independently by two of the authors (M.R. and M.F.). Disagreements were resolved through discussion.

### 2.3. Eligibility criteria

In this study, we specifically investigated the experiences of individuals with lower extremity dysfunction who were undergoing treatment with wheelchair, whether manual or powered.

### 2.4. Inclusion criteria

- *Population*: Focused on WUs, to capture evidence about social and psychological experiences.
- *Age Group*: Studies that focus on adult (>18) WUs.
- *Geographical Scope*: Studies from all countries.
- *Publication Date*: Studies published within a specific timeframe of 2000–2024.
- *Study Design*: Qualitative and quantitative studies as well as mixed-methods research.
- *Context*: Studies should consider socio-emotional experiences in everyday life, QoL, and social and psychological well-being within various contexts, such as public spaces, or social interactions.
- *Peer-Reviewed*: Only peer-reviewed articles to ensure the quality and credibility of the research.
- *Language*: Full-text articles published in English

### 2.5. Exclusion criteria

- *Theoretical Papers:* Papers focused solely on theoretical frameworks without empirical data on socio-emotional experiences.
- *Measure Testing*: Studies that focus only on testing or developing new measures or instruments.
- *Historical Reviews*: Reviews that focus on historical perspectives or developments rather than current socio-emotional experiences of WUs.
- *Patents*: Technical descriptions of wheelchairs.
- *Editorials/Commentaries*: Opinion pieces, editorials, and commentaries that do not provide original research data or empirical evidence.
- *Lectures/Speeches*: Content from lectures, speeches, and other non-peer-reviewed presentations.
- *Abstracts/Bibliographies/Review Papers/Book Reviews*: Abstracts, bibliographies, and book or paper reviews that do not present full research studies or detailed findings.
- *Context:* Studies focusing *training programs, financial issues, accessibility in specific environment (e.g., tennis or basketball court), engineering development, design developments,* and communication technologies *(ICTs)* not related to general experiences of or WUs.
- *Service Providers*: Research focused on service providers' experiences rather than those of Wus.
- *Parents, friends, family and caregivers' experiences*: Studies focusing on the experiences of parents or caregivers rather than the WUs themselves.
- *Ambulatory Products*: Studies related to walkers, canes, scooters, and crutches.
- *In-Vitro Research*: Laboratory-based in-vitro research that does not involve WUs' socio-emotional experiences.

- *Clinical Trials*: Clinical trials focused on surgical or medical interventions.

### 2.6. Study selection

Study selection was conducted in three main phases: First, the titles and abstracts of the citations were independently screened for relevance to the inclusion criteria by the authors. Second, authors combined possibly relevant citations and included discrepancies in the full-text review. Finally, during a group discussion, we reviewed and retrieved the potential eligible full-text articles and reached a consensus on disagreements or ambiguities. Search results were uploaded into Zotero for reference management, where duplicates were removed both automatically and manually. The remaining titles and abstracts were exported to Microsoft Excel, organized alphabetically, and screened for eligibility by M.R., C.C., and M.F.

### 2.7. Critical appraisal

Initially, the authors ensured all socio-emotional aspects of WUs were considered, even if not the primary focus, providing a comprehensive and transparent synthesis of findings. Then, the McGill University Mixed Methods Appraisal Tool (MMAT)[21] was employed to evaluate the methodological quality of the articles. This validated and reliable tool[22,23] is suitable for assessing qualitative, quantitative, and mixed-method studies. Accordingly, all three authors independently screened a random sample of articles (See Appendix B), with only 5 % disagreement, resolved through discussion. This triangulated review process ensured accuracy and reliability in the quality analysis of the included studies.

### 2.8. Data extraction and analysis

In alignment with scoping review methodology, key information was gathered from the included publications using an organized data extraction framework,[24] which was divided into two following sections: (1) General publication details (including the authors' name, year of publication), and descriptive information (country, study methods, type of wheelchair, and sample size); and (2) Categories of explored domains, in which the socio-emotional experiences were identified. To systematically determine the socio-emotional domains, we first extracted all mentions of socio-emotional aspects from each study, recording them without predefined categories to ensure an open and comprehensive assessment. Next, we conducted an inductive thematic analysis, grouping similar socio-emotional aspects into preliminary categories. This process was carried out independently by each author, followed by joint discussions to refine and consolidate the themes. The final categorization was based on two main criteria: (1) the frequency and emphasis of each socio-emotional aspect across multiple studies. For instance, if a study discussed accessibility and its socio-emotional impact, the authors identified which socio-emotional domains were most emphasized and explored; and (2) the relevance of each aspect to the lived experiences of WUs in relation to mobility aids. This structured approach not only allows for the identification of patterns and gaps in the existing literature on socio-emotional experiences but also highlights areas where design recommendations could be most beneficial.

In the results, the table of studies is categorized and presented based on the design approaches: qualitative, quantitative, and mixed methods. This enables us to systematically compare the different methodologies, understand their contributions to the research on MA users' socio-emotional experiences, and identify which approaches have been most commonly applied.

## 3. Results

### 3.1. Describing the literature

Following the removal of duplicates, 271 citations were identified from electronic database searches and three relevant journals. A total of 135 full-text articles were retrieved, of which 48 were included (Fig. 1). These studies were classified as qualitative (n = 31), quantitative (n = 13), and mixed methods (n = 4). Among the total participants (n = 1293), the majority were involved in qualitative studies (n = 466), with the remainder participating in quantitative studies (n = 663) and mixed methods studies (n = 164). In addition, most of the studies included PWs (n = 31), while MWs were less frequently involved (n = 20). In a few studies, the type of wheelchair was unclear (n = 5). Mobility scooters (MS) were also type of mobility aids alongside wheelchairs in some studies (n = 6). Tables 1–3 present a general summary of the data extraction. According to the findings, the majority of studies on the socio-emotional experiences of WUs were conducted in Canada (n = 11), followed by Sweden (n = 9), the U.S. (n = 7) and U.K. (n = 6). Other countries conducted more limited investigations including Denmark, Brazil, and China (all n = 2), and Italy, Norway, Spain, Ghana, Turkey, Netherlands, Kenya, and Germany (all n = 1). In only one case, the country and context of study were not mentioned (Fig. 2).

Domains of socio-emotional experiences.

In line with the aim of study, six domains of socio-emotional experiences were explored in the literature: social stigma & discrimination, self-identity & body image, social integration & support, independence & autonomy, emotional well-being, and perception of control and agency (Fig. 3). Following are the descriptions of each domain.

- *Social stigma & discrimination*: This factor addresses the external negative attitudes and biases that WUs face from society, leading to feelings of exclusion or being judged based on their MAs rather than their abilities.
- *Self-perception & identity*: This relates to how WUs see themselves and how their identity might be influenced by their use of a MAs. It encompasses personal reflections on dignity, self-worth, and how they perceive their place in society.
- *Social integration & support*: This refers to the extent to which WUs feel included in social settings, despite any physical limitations. It also encompasses the support networks available to them—family, friends, and community resources—that foster connection and belonging.
- *Independence & autonomy*: This aspect emphasizes the user's ability to perform daily activities and make decisions without relying heavily on others. It's about the freedom to navigate their environment and live life on their own terms.
- *Emotional well-being*: This includes the overall mental and emotional health of WUs, which can be impacted by their experiences of using a MA, such as feelings of depression, anxiety, or contentment.
- *Perception of control & agency*: This reflects WUs' socio-emotional experience of feeling empowered and in control of their lives, shaping their confidence, autonomy, and self-determination.

To present the categories, we aimed to highlight distinct aspects of WUs' experiences. For instance, while *independence & autonomy* and *perception of control & agency* may appear similar, former focuses on the practical ability to perform tasks, whereas latter relates to the emotional experience and self-perception associated with that independence.

### 3.2. Prevalence of the six explored socio-emotional domains

The investigation revealed that *independence & autonomy* (n = 39, 26 %) was the most explored and reported domain, indicating a strong focus on the importance of self-reliance and personal freedom for WUs (Fig. 3). Social integration & support, and perception of control &

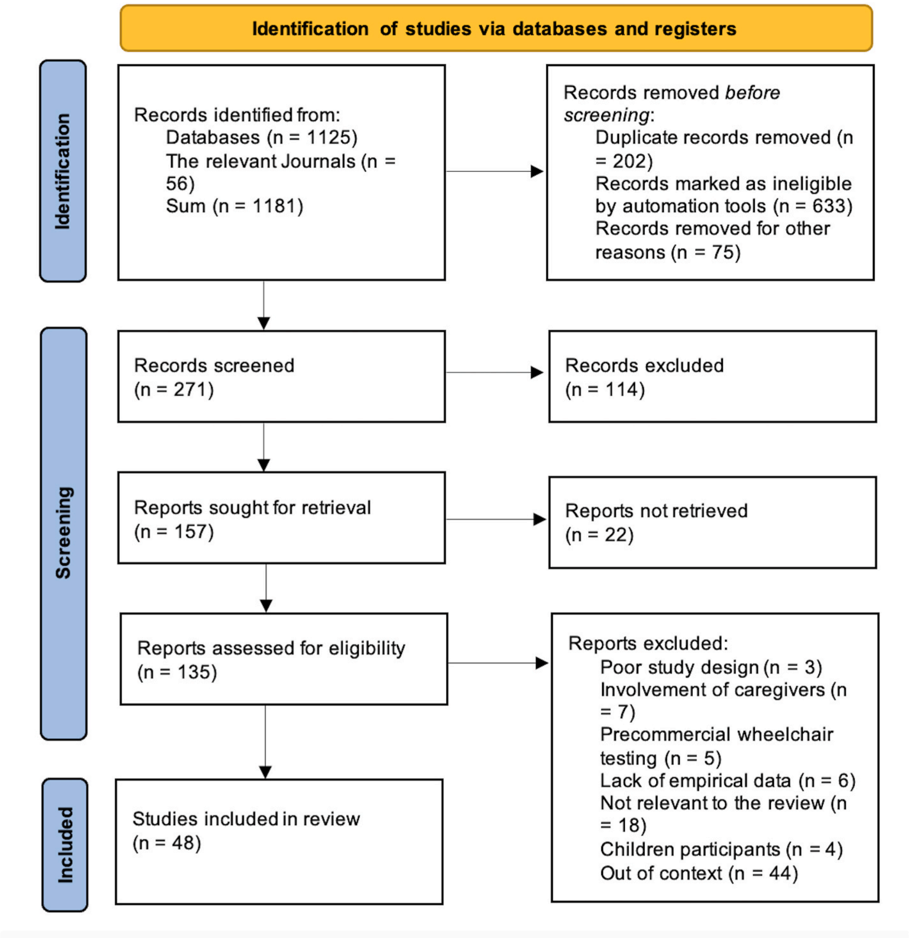

**Fig. 1.** PRISMA flow chart of the selection of included articles.

agency (both n = 33, 22 %) ranked second, and *emotional well-being* (n = 24, 16 %) ranked third, showing a significant concern for social connectivity and the psychological effects of mobility on well-being. The lowest rates of reports of socio-emotional experiences were related to *self-identity & body image* (n = 14, 9 %) and *social stigma & discrimination* (n = 7, 5 %). This indicates that these domains, while crucial, may receive less attention or are underreported in comparison to other socio-emotional domains.

Each of these domains is shown in the classification of qualitative, quantitative and mixed methods studies in Fig. 4. The diagram shows the most explored domain across all methods is *independence & autonomy*, with qualitative studies (n = 25), quantitative (n = 10), and mixed methods (n = 4). The domain of *perception of control & agency* follows closely, with qualitative studies (n = 21), quantitative (n = 9), and mixed methods (n = 3). Social integration & support also ranks highly, especially with qualitative studies (n = 22) but fewer quantitative (n = 9) and mixed methods (n = 2). In contrast, self-identity & body image and social stigma & discrimination are the least explored areas. Self-identity & body image includes qualitative studies (n = 9), quantitative (n = 4), and mixed methods (n = 1), while social stigma & discrimination has qualitative studies (n = 6), quantitative (n = 1), and no mixed methods (n = 0). Emotional well-being falls between these extremes, with qualitative studies (n = 14), quantitative (n = 7), and mixed methods (n = 3).

### 3.3. *Introducing themes*

In this section, the authors categorize the explored domains into three interconnected themes, reflecting a hierarchical progression of WUs' needs. These range from functional requirements like control and autonomy to more abstract needs such as social identity.

*Themes I: Foundations: Autonomy & Control:* This theme, which links the two domains of *independence & autonomy* and *perception of control & agency*, is more extensively explored in the literature (48 %), nearly half of the total, and surpasses the exploration of the other four domains combined (52 %). *Independence & autonomy* emphasizes personal freedom and self-reliance, highlighting how WUs' ability to engage in social spaces and form relationships is affected by their lack of independence. The perception of control and agency pertains to the extent to which WUs feel they can influence their social and physical environments, emphasizing the psychological and emotional dimensions of self-determination. This is reflected in the reviewed studies, which highlight how a strong sense of agency fosters empowerment, enabling individuals to engage in social interactions with greater confidence and autonomy.[38,40,41,43] A selection of quotes from the included studies is provided below:

> *"Findings also imply that participation means being autonomous and making decisions about one's own life ...".*[38]

> *"'It's my legs' emphasised how powered wheelchairs are a form of mobility that not only enables users to take part in activities, but also impacts their identities, past and present".*[41]

> *"Overall, the review showed that wheelchair factors and accessibility the most frequently reported factors associated with participation,...".*[40]

Given their frequent discussion in the literature, these domains appear to be central to WUs' socio-emotional experiences and may facilitate greater social participation and inclusion.

**Table 1**
The list of studies with qualitative methods, and the explored domains of socio-emotional experiences of WUs.

| General publication details and descriptive information | | | | Categories of explored domains | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Author, year | Country | Type of MA[a] | Sample size | Social stigma & discrimination | Self-identity & body image | Social integration & support | Independence & autonomy | Emotional well-being | Perception of control & agency |
| Abu–Sadat, 2023[25] | Ghana | MW | 2 | | | | ✓ | | |
| Barbareschi et al., 2021[26] | Kenya | NS | 54 | ✓ | | | | | |
| Barker et al., 2004[12] | Canada | MW, PW, MSc | 10 | | | ✓ | ✓ | ✓ | ✓ |
| Barker et al., 2006[27] | Canada | MW, PW, MSc | 10 | | | ✓ | ✓ | | ✓ |
| Barlew et al., 2013[9] | U.S. | NS | 6 | ✓ | ✓ | | | ✓ | |
| Blach Rossen et al., 2012[28] | Denmark | PW | 9 | | ✓ | ✓ | ✓ | | |
| Böttger et al., 2022[29] | Germany | PW | 5 | | ✓ | ✓ | ✓ | | ✓ |
| C. Pettersson et al., 2014[30] | Sweden | PW, MSc | 16 | | | | ✓ | | ✓ |
| Costa et al., 2010[31] | Brazil | NS | 10 | | ✓ | | ✓ | ✓ | ✓ |
| Edberg & Persson, 2011[32] | Sweden | NS | 11 | | | ✓ | ✓ | | ✓ |
| Evans et al., 2007[33] | U.K. | PW | 17 | | | ✓ | ✓ | ✓ | ✓ |
| Evans, 2000[34] | U.K. | PW | 8 | | | | ✓ | ✓ | ✓ |
| Fortin-Bédard et al., 2022[35] | Canada | MW | 14 | | | ✓ | ✓ | ✓ | |
| Frank et al., 2010[36] | U.K. | PW | 64 | | | ✓ | ✓ | ✓ | ✓ |
| Henje et al., 2021[37] | Sweden | PW | 13 | | | ✓ | | | |
| Hjelle & Vik, 2011[38] | Norway | NS | 6 | | | ✓ | ✓ | | ✓ |
| Korotchenko & Hurd Clarke, 2013[39] | Canada | PW, MSc, | 29 | | | ✓ | ✓ | | ✓ |
| Kristiansen, 2018[40] | Sweden | PW | 5 | ✓ | | ✓ | ✓ | | ✓ |
| Labbé et al., 2018[41] | Canada | PW | 19 | | ✓ | ✓ | | | ✓ |
| Lindström et al., 2022[42] | Sweden | PW | 15 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mattie et al., 2020[43] | Canada | MW | 8 | | | ✓ | ✓ | ✓ | ✓ |
| P. R. J. Giacobbi et al., 2010[44] | U.S. | PW | 20 | | | ✓ | ✓ | ✓ | ✓ |
| Pfeiffer et al., 2024[45] | U.S. | MW | 6 | | | ✓ | ✓ | | |
| Qiao et al., 2024[46] | China | MW | 24 | | ✓ | | | ✓ | |
| Reid et al., 2003[47] | Canada | MW, PW, MSc | 11 | | | ✓ | ✓ | | ✓ |
| Rogers & Musselwhite, 2023[48] | U.K. | PW, MW | 11 | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Rousseau-Harrison et al., 2012[49] | Canada | MW, PW | 10 | | | ✓ | ✓ | ✓ | |
| Rushton et al., 2014[50] | Canada | PW | 12 | | | ✓ | ✓ | | |
| Stenberg et al., 2016[51] | Sweden | PW | 15 | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Torkia et al., 2014[52] | Canada | PW | 12 | | | | ✓ | | ✓ |
| Widehammar et al., 2019[53] | Sweden | PW | 14 | ✓ | | ✓ | | | ✓ |

[a] Mobility aids: MW = Manual wheelchair; PW=Powered wheelchair; MSc=Motorized Scooter; NS=Not specified.

Theme II: Connections: Social Participation & Support: This theme, centered on social integration and support, accounts for almost one fifth (22 %) of the included studies and represents key steps toward active societal participation. It highlights the importance of social connections and support systems, such as networks of family, friends, and organizations. Social integration refers to WUs' ability to engage in community activities, while support addresses the assistance provided. This theme emphasizes the importance of social participation and accessible support in reducing isolation and fostering a sense of belonging, enabling WUs to affirm their self and social identity.[40,59,60,65,71] This mediating role of social participation and support is reflected in the following sample quotes:

> "*However, the electric wheelchair users were constantly confronted with stigma, because of the status of the disabled in society, which, sometimes isolated the users and negatively affected their self-concepts and identity …*".[40]

> "*… identity is formed of interactions between internal conceptions of self and the presentation and experience*".[48]

*Theme III: Reflection: Self- & Social-Identity*: This theme, which combines *social stigma & discrimination* (5 %) with *self-identity & body image* (9 %), is less frequently reported in the literature (14 %). It illustrates how societal attitudes shape both how WUs are externally perceived and how they internally view themselves. *Social stigma & discrimination* refer

**Table 2**
The list of studies with quantitative methods, and the explored domains of socio-emotional experiences of WUs.

| General publication details and descriptive information | | | | Categories of explored domains | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Author, year | Country | Type of MA[a] | Sample size | Social stigma & discrimination | Self-identity & body image | Social integration & support | Independence & autonomy | Emotional well-being | Perception of control & agency |
| Brandt et al., 2004[54] | Denmark | PW | 111 | | | ✓ | ✓ | | ✓ |
| Chan & Chan, 2007[55] | China | MW | 31 | | | ✓ | ✓ | | |
| Davies et al., 2003[56] | U.K. | PW | 51 | | | ✓ | ✓ | | |
| de Groot et al., 2010[57] | Netherlands | MW | 109 | | | | ✓ | | ✓ |
| Greenhalgh et al., 2021[58] | U.S. | MW | 24 | | ✓ | | | ✓ | ✓ |
| I. Pettersson et al., 2010[59] | Sweden | MW | 32 | | ✓ | | ✓ | ✓ | ✓ |
| Lanutti et al., 2015[60] | Brazil | MW | 10 | | ✓ | ✓ | | ✓ | |
| Meyers et al., 2002[61] | U.S. | MW | 28 | | | ✓ | ✓ | | ✓ |
| Mortenson et al., 2022[62] | NS** | MW,<br>PW,<br>MSc | 105 | | | ✓ | | ✓ | ✓ |
| Örücü Atar et al., 2024[63] | Turkey | Stand PW | 20 | | ✓ | | ✓ | ✓ | |
| Pettersson et al., 2009[64] | Sweden | PW | 32 | | | ✓ | ✓ | | ✓ |
| Pousada García et al., 2015[65] | Spain | MW/ PW | 60 | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Ward et al., 2015[66] | U.S. | PW | 50 | | | ✓ | ✓ | ✓ | ✓ |

[a] Mobility aids: MW = Manual wheelchair; PW=Powered wheelchair; MSc=Motorized Scooter, **NS=Not specified.

**Table 3**
The list of studies with mixed methods, and the explored domains of socio-emotional experiences of WUs.

| General publication details and descriptive information | | | | Categories of explored domains | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Author, year | Country | Type of MA[a] | Sample size | Social stigma & discrimination | Self-identity & body image | Social integration & support | Independence & autonomy | Emotional well-being | Perception of control & agency |
| Garber et al., 2002[67] | U.S. | MW/ PW | 49 | | | ✓ | ✓ | ✓ | ✓ |
| May & Rugg, 2010[68] | U.K. | PW | 20 | | | | ✓ | ✓ | ✓ |
| Rudman et al., 2006[69] | Canada | MW | 16 | | ✓ | ✓ | ✓ | | |
| Salatino et al., 2016[70] | Italy | PW | 79 | | | | ✓ | ✓ | ✓ |

[a] Mobility aids: MW = Manual wheelchair; PW=Powered wheelchair.

to the negative biases and marginalization WUs face, impacting their interactions and inclusion in public spaces. *Self-identity & body image* explore how WUs internalize these external perceptions and how mobility devices influence their self-image, with wheelchairs often becoming extensions of their identity.[10,72] Media and societal representations,[73,74] whether positive or negative, play a key role in shaping this self-perception.[50,53,59,71,75] Together, these categories reveal the complex interplay between societal views and personal identity, crucial for understanding WUs' socio-emotional experiences. Regarding the emerging themes, Fig. 5 illustrates the identified themes and their interconnections.

Although not explicitly included in the three themes, emotional well-being is closely connected to all of them. Autonomy and control foster a sense of self-worth and agency, which are critical to emotional health. Social integration and support systems help combat isolation, promoting inclusion and belonging. Additionally, societal perceptions and self-identity shape emotional responses, as negative stigmas can erode self-esteem while positive representations boost confidence. Emotional well-being, therefore, is not an isolated domain but rather a dynamic outcome influenced by the combined effects of autonomy, social connection, and identity.

## 4. Discussion

The aim of this scoping review was to map the domains of socio-emotional experiences of WUs. Out of 48 studies reviewed, 31 were qualitative, often small-scale trials, with more than half involving fewer than 15 participants. The remaining studies were conducted with 13 quantitative and four mixed methods.

### *4.1. Global disparities in wheelchair access research*

Fig. 2 illustrates countries such as Canada, Sweden, the United States, and the United Kingdom have conducted substantial research on

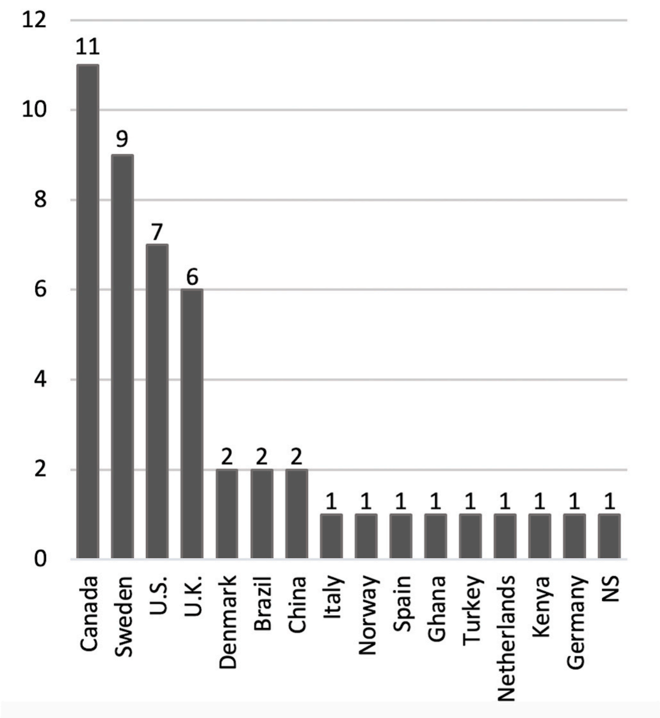

**Fig. 2.** Distribution of studies by country.

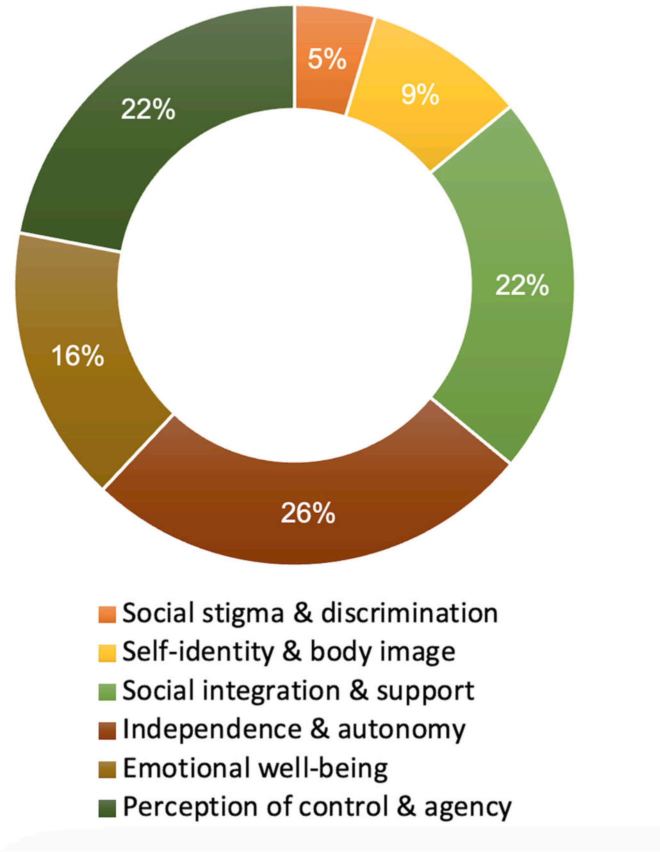

**Fig. 3.** The percentages of the explored domains of socio-emotional experiences.

WUs' experiences, surpassing other nations. These countries have a strong tradition of disability rights advocacy, supported by progressive policies and legal frameworks like the Americans with Disabilities Act (ADA) in the U.S.,[76] the Disability Discrimination Act in the U.K.,[77] and comprehensive legislation in Canada and Sweden.[78] They emphasize inclusivity, viewing disability as a socio-political issue connected to human rights.[79] These policies and views collectively contribute to their leadership in disability research, reflecting a broader commitment to creating equitable, inclusive societies. Reports reveal that in developed nations, about 1 % of people (10 million) still need wheelchairs, demonstrating that their essential right to mobility and participation in society is still not fully addressed. On the other side, in developing nations, this need rises to 2 % (121.8 million people).[80] Alarmingly, less than 10 % of individuals in developing regions have access to wheelchairs, underscoring that their fundamental right to mobility, as a first step, remains largely unmet.[81] This highlights the need for research to amplify WUs' voices on the global scientific platform. For example, a report highlights widespread discrimination against people with disabilities in Iran, leading to confinement at home due to a lack of independence.[6,82] Therefore, there is a significant gap in the scientific literature regarding systematic observations of WUs' socio-emotional experiences, especially in developing countries. While gray literature continues to emphasize accessibility,[83–85] there remains a critical gap in understanding the socio-emotional experiences of WUs, especially in developing regions.

### 4.2. Reviewing the explored domains

*Independence & autonomy*, along with *perception of control & agency*, were the most frequently studied domains, whereas *social stigma & discrimination* and *self-perception & body image* received less attention. This discrepancy likely arises from a research focus on mobility and functional independence aligned with rehabilitative goals, overshadowing important socio-emotional aspects like stigma and self-identity. As the studies indicate that individuals with disabilities seek not merely to escape an identity defined by limitation and dependence, but to cultivate an identity characterized by self-fulfillment.[86] It is logical that those still struggling with independence have their efforts toward self-fulfillment less reflected in studies. The challenge of measuring internalized stigma and body image, coupled with societal discomfort discussing these issues, contributes to their underrepresentation in literature. Despite media coverage of self-perception, social stigma, and discrimination issues,[6,84,85] these perceptual concerns remain largely neglected in academic studies. Addressing these gaps is essential for a comprehensive understanding of WUs' socio-emotional experiences.

The domain of social integration & support may be influenced by various factors such as accessibility, social attitudes, and available support systems.[87] However, achieving *independence & autonomy* can facilitate social integration by providing individuals with greater control over their mobility, thereby cultivate more opportunities for social interaction.[40,59,60,65,71] In line with this, studies, including systematic reviews, have similarly found that higher levels of social support are associated with enhanced mobility, independence, productivity, and participation in social activities.[35,88–90] Accordingly, these areas are frequently reported close together. This suggests that while independence & autonomy remain primary concerns in WUs' experiences, social integration & support also become crucial once independence is attained.[91] Previous studies have confirmed that autonomy and social engagement together contribute to the unified goal of enhancing a person's QoL.[92] Users first prioritize autonomy for navigating social spaces, but once achieved, they shift focus to social engagement and support networks.

In *emotional well-being*, WUs may experience a range of feelings, from satisfaction,[93] to humiliation, frustration, loss, and humility.[9] These emotions arise from various influences, such as the enhanced

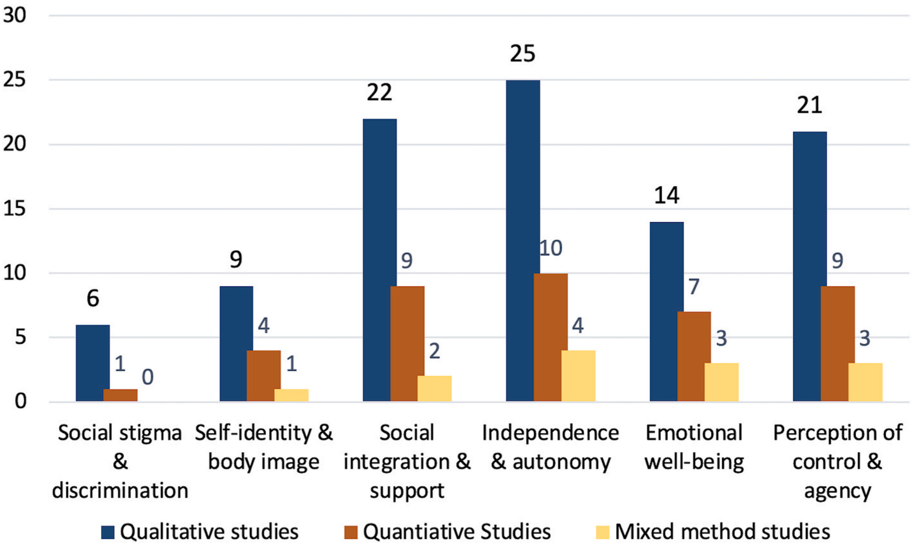

**Fig. 4.** The number of the explored domains of socio-emotional experiences based on the categories of study methods.

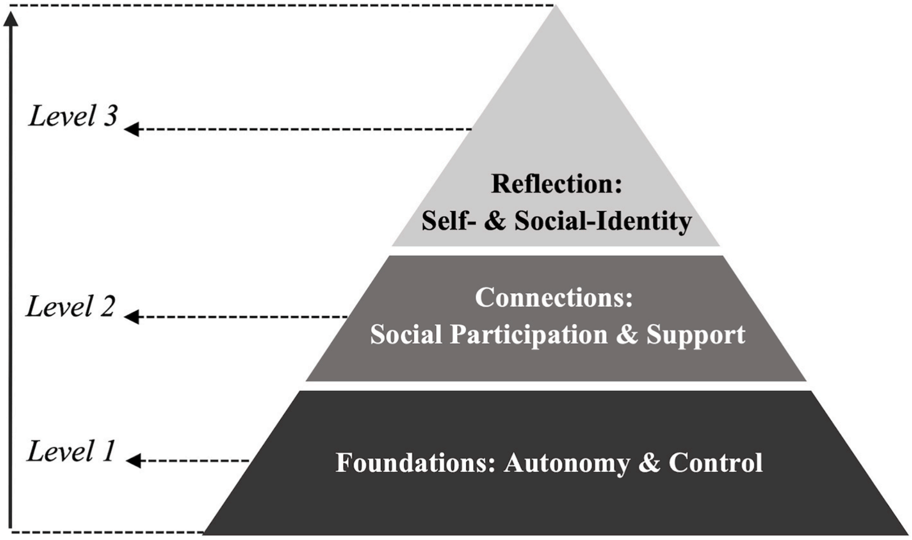

**Fig. 5.** The hierarchical progression of WUs' needs.

independence and social participation provided by powered wheelchairs, which increase satisfaction and positive emotions.[93] However, these experiences are also linked to self-identity factors.[94] Therefore, emotional well-being likely results from a complex interplay of factors, highlighting the need for future studies to systematically explore the relationship between emotions and these domains.

### *4.2.1. Design insights based on the themes*

To address the *Foundations: Autonomy & Control,* optimizing devices and environments is essential for enabling WUs to feel independent and engage equally in social interactions. This involves both city infrastructure and transportation planning, as well as integrating advanced features into wheelchair development. Technical experts can play a crucial role in addressing potential discomforts. These efforts can be expanded to help ensure that, WUs feel no discrepancies between themselves and others. For example, aligning accessible seating with regular seating on buses can promote a sense of normalcy. Additionally, while ensuring environmental optimizations (*e.g.*, obstacle-free buildings, ramps, and handrails), it is important to consider WUs' safety and communication—key elements of control—within social contexts through advancements like external Human Machine Interfaces (eHMIs).[95] These technical interventions collectively enhance WUs' sense of autonomy and control.

While autonomy and control create the foundation for WUs to engage in social life, targeted policies and interventions are necessary to ensure their participation is fully supported. To enhance social integration and support, collaboration among social service providers, urban planners, and designers could help create environments that foster natural social integration.[96] This can include designing public spaces, such as parks, plazas, and cafes, where the layout invites interaction, such as accessible seating arrangements interspersed with general seating, rather than isolating accessible seating to the periphery. Social programs that pair WUs with non-disabled peers in collaborative or recreational activities[97] can help break down barriers and reduce social stigmas.[98] Another impactful intervention is creating inclusive workplaces where employers actively support WUs through mentorship programs and adaptive work environments.[99] These interventions aim not only to reduce physical barriers but to cultivate a society where WUs feel fully integrated and supported in their everyday interactions.

However, social participation for WUs, is often accompanied by challenges, particularly in navigating societal assumptions and biases. While many people claim not to hold prejudices against individuals with disabilities, research shows that WUs continue to face significant stigma, leading to feelings of isolation, discomfort, and depression.[100] This is central to the theme of Reflection: Self- & Social-Identity, where societal perceptions and stereotypes heavily influence how WUs view themselves and are viewed by others.[9–11] A key factor in shaping these perceptions is in the wheelchair itself, often seen as a symbol of disability. Designing MAs purely for function, without considering their social and aesthetic impact, can perpetuate stereotypes.[101] Integrating elements of emotional appeal, such as inspiration and empowerment into design can transform both user[102] and societal perceptions. Studies show that modern, innovative designs elicit positive emotional responses from users,[101,103,104] and the public.[105] Shifting from traditional designs that emphasize limitation to those conveying activity, confidence, and individuality helps reshape society's view of WUs. Additionally, diverse visual representations of WUs in public spaces—depicting active, diverse individuals across age, gender, and ethnicity—can challenge stereotypes and promote inclusivity.[106] Ultimately, these interventions support WUs in not only escaping an identity confined by limitation and dependence, but in cultivating one rooted in self-fulfillment and empowerment.

### *4.3. Limitations and future studies*

Since the literature search was conducted, additional studies may have been published that could have been included. Nevertheless, the current review provides a broad overview of the literature, spanning over 23 years of research. While this study focused on the themes emerging from WUs' socio-emotional experiences and the design insights based on those themes, future research could also consider the policy and practical implications, thereby helping to bridge the gap between theory and tangible improvements in the QoL for WUs. In terms of policy, it is needed for inclusivity-oriented interventions and standards that address the socio-emotional needs of WUs,[82] ensuring that interventions promote autonomy, agency, and social participation. In practice, designers and healthcare professionals could consider perceptual factors, such as self-identity and social identity, to enhance WUs' visibility and public interaction. Specifically, this research calls for further exploration of how design aesthetics influence social perception and interaction.

## 5. Conclusion

This paper presents a scoping literature review on social-emotional experiences of WUs, highlighting that independence & autonomy, perception of control & agency, and social integration & support are the most frequently reported domains. In contrast, *self-identity & body image*, and *social stigma & discrimination* are the least reported. These categories in turn can impact WUs' *emotional well-being*. Based on these findings, three themes of Foundations: Autonomy & Control, social integration & support, and Reflection: Self- & Social-Identity are introduced, suggesting areas where design insights could enhance WUs' socio-emotional experiences and QoL.

## CRediT authorship contribution statement

**Mohsen Rasoulivalajoozi:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization, Supervision. **Carmela Cucuzzella:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Funding acquisition. **Morteza Farhoudi:** Writing – review & editing, Software, Methodology, Investigation, Formal analysis, Data curation.

## Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used ChatGPT Open AI in order to improve the writing. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

## Disclosure

The authors confirm that the abstract of this research has not been presented at any other meetings, symposiums, conferences, events and preprint sites.

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## Conflicts of interest

The authors state there are no conflicts of interest. The funders did not contribute to the study's design, data collection, analysis, manuscript writing, or the decision to publish the results.

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## Appendix A. Supplementary data

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