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The dynamics of affective experiences with wheelchair use during rehabilitation: A qualitative study through physiotherapists' perspectives

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ABSTRACT

The interaction between users and mobility aids, including emotional attachment and functional expectations, influences their perceptions and decisions on acceptance and continued use during rehabilitation. Tracking interactions during rehabilitation helps identify key intervention points, leading to effective therapeutic relationships and user-centered mobility aid designs. This study aims to track the dynamics of affective experiences (DAE) of wheelchair users (WUs) during a planned rehabilitation timeframe and recommend how to manage these dynamics. To this end, initially, the product experience framework was applied for the development of interview guidelines and analysis. Next, adopting a qualitative approach, semi-structured, in-depth interviews with 12 experienced physiotherapists were conducted in Iran. Transcripts were then analyzed using a thematic analysis framework to identify themes. A total of three themes have been identified which include: 1) Coping in Using the Wheelchair, 2) Reluctant Acceptance of the Wheelchair: Adjusting to the New Normal, and 3) Approaching Recovery: Challenges in Over-reliance. Additionally, two diagrams illustrating the dynamics of the affective experience of WUs and its influencing factors during rehabilitation have been provided. This study shows that the affective experience of WUs is not static and changes through various stages of rehabilitation. This dynamic is influenced by factors of emotional and functional importance, both of which often grow after initial resistance but follow varied patterns. However, emotional attachment can sometimes lead to over-reliance even after recovery, posing challenges in the rehabilitation. Physiotherapists can help balance this attachment, influencing users' affective experiences with their wheelchairs.

1. Introduction

User-product experience is influenced by major components including the aesthetic response, operation and attributed meanings, as well as users' personal goals and aspirations, leading to emotional responses (*Product experience,* 2007; Rasoulivalajoozi & Farhoudi, 2025). Similarly, individuals with mobility disabilities experiences with their mobility aids (MAs), such as wheelchairs, are influenced by meaningful situational and contextual factors (Rasoulivalajoozi et al., 2025a). Potential wheelchair users (WUs) are often aware that the assistive devices they intend to buy can carry negative stereotypes, setting them apart from individuals without a disability (Cahill & Eggleston, 1995). In other words, WUs' perceptions are influenced by social context, interactions, cultural factors, and even language (Barbareschi et al., 2021; Grue, 2016; Matin, 2021). Such negative stereotypes about MAs can affect users' perceptions and decisions to use them. Given that these MAs are constantly connected to the users' bodies and may be considered an extension or part of their bodies (Blach Rossen et al., 2012; Costa et al., 2010). Therefore, perceptions toward their wheelchair represent emotional understanding of their body that play a role in the social participation (Costa et al., 2010; Rasoulivalajoozi & Farhoudi, 2025). A study indicates that WUs, especially females, generally had negative emotional responses such as hate, disgust, contempt, disappointment, anger, and regret (Mokdad et al., 2018). Thus, users' perceptions of MAs are continuously influenced by social stereotypes and interactions (Barlew et al., 2013; Costa et al., 2010; Edberg & Persson, 2011), leading to perceived pity, depression (Saia et al., 2024), and reduced social interaction (Rasoulivalajoozi et al., 2025a).

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As Mokdad et al. emphasized, we need to ask who is responsible for these results: the designers of MAs, social attitudes toward the disabled, or both. Although changing the perceptions and negative emotional responses toward wheelchairs requires a collective effort (Mokdad et al., 2018), we need to first find out how such perceptions in user-wheelchair interactions are shaped and may fluctuate over the rehabilitation. Without understanding and tracking the dynamics of perceptions end emotional responses throughout rehabilitation, we cannot develop effective interventions to enhance the acceptance and consistent use of wheelchairs. Emotions are typically intense, specific, and short-lived, however, they collectively can form broader affective experiences, such as overall mood trends and general outlook on recovery (e.g., optimism or pessimism during rehabilitation) (Pňaček(ová), M., 2022). Therefore, to track perceptions of wheelchairs throughout a planned rehabilitation timeframe we need to prioritize the Dynamics of Affective Experiences (DAE) over the fluctuation of emotions. DAE, likely cannot be static and are changed (Bettiga & Lamberti, 2018; Yoon et al., 2020), at each stage of the rehabilitation from purchasing to the end of usage.

Tracking the DAE in using wheelchair during the rehabilitation timeframe helps in developing training programs aimed at improving effective therapeutic relationships for physiotherapists. It enhances physiotherapists' understanding of users' adherence to or rejection of wheelchairs or other types of MAs, thereby improving rehabilitation outcomes and user satisfaction. Furthermore, this exploration could emphasize the importance of affective attachment with wheelchairs to promote user-centered design in MAs. This calls for identifying design criteria and interventions influencing users' responses (Carneiro et al., 2017), providing positive perceptions, and encouraging continued use. Socially, this tracking reveals how users' perceptions of disability change under the influence of social discourse on disability throughout the timeframe of rehabilitation. This helps to provide policies and practices to mitigate the stigma and social disengagement.

In this regard, previous studies have predominantly focused on the interaction between individuals with mobility disabilities and their assistive devices, including wheelchairs, from various perspectives. These perspectives include improving environmental factors (Hossen Sajib, 2022; Widehammar et al., 2019), ergonomic optimizations (Widehammar et al., 2019), engineering aspects (Bastos et al., 2017), and health status, collectively enhancing WUs' experience. One study found that patients with more severe impairments rated their wheelchair less positively than those with less impairment, indicating a positive correlation between health status and attitudes toward the wheelchair (Antler et al., 1969). Previous research has also highlighted the emotional design of wheelchairs (Carneiro et al., 2017; Desmet & Dijkhuis, 2003; Mokdad et al., 2018) and their role in social participation (Brandt et al., 2004; Rousseau et al., 2012; Sapey et al., 2005). Socially, wheelchairs have been shown to significantly impact social involvement (Carneiro & Rebelo, 2018). One study demonstrated a difference in understandings of prescribers and WUs, highlighting that users place greater importance on emotion and appearance (Mortenson & Miller, 2008). This finding emphasizes the unique perceptions among WUs that need to be investigated and tracked in more depth. To the best of our knowledge, this study is the first to monitor the DAE in using wheelchair throughout the rehabilitation, addressing a significant gap in existing research.

While some individuals may require MAs for their entire life, others may only need wheelchairs temporarily. This study aims to explore the phases of wheelchair usage and the associated perceptions during a planned rehabilitation timeframe, drawing on the in-depth experiences of physiotherapists who participated in the interviews. We particularly focus on identifying the interaction challenges that WUs face in both public and private settings, which shape their affective experience in using their wheelchairs. In alignment with the study's goal, we specifically address the following questions: What key themes represent the different phases of DAE in using wheelchair throughout rehabilitation, and how do these dynamics emerge and transform? The contributions are summarized as follows:

- Tracking WUs' affective experience over a timeframe contributes to disability studies and physiotherapy for developing protocols in phases of prescribing MAs and monitoring the rehabilitation.
- Health design thinking experts can introduce relevant design interventions in services and assistive products to enhance inclusivity, considering the dynamics of perceptions throughout the rehabilitation.

2. Method

2.1. Establishment of the study procedure

As the depth of information and socio-economic and cultural factors are important for understanding the complex emotions and social interactions associated with MAs, a qualitative approach—specifically, a thematic analysis within an interpretivist paradigm—were taken to capture a wide range of perspectives (Özcan et al., 2021). Thematic analysis was chosen for its ability to identify, analyse, and report patterns within qualitative data, providing a rich and detailed understanding of participants' perspectives. This approach is characterized by flexibility (Busetto et al., 2020), making it beneficial for tracking the DAE of WUs. Such dynamic can be explored through interviews with physiotherapists, due to their close, long-term relationships with people with mobility disabilities (Chartered Society of Physiotherapy, n.d.). Additionally, physiotherapists generate valuable insights from their interactions with a diverse range of individuals with varying mobility disabilities, insights that may not be easily captured in interviews with vulnerable WUs. Therefore, physiotherapists were the most appropriate participants for this study. Other studies have also adopted this approach, relying on healthcare providers to represent the needs and experiences of target groups and patients (Coombs et al., 2022; Cucuzzella et al., 2024; Jack et al., 2018). We initially used the *product experience framework* to interpret WUs' experiences over time (Desmet & Hekkert, 2007). Subsequently, we employed in-depth interviews (IDIs), aligned with our research objectives (Jamshed, 2014; Longhurst, 2009). Following the identification of the themes, we defined the Level of Dependence Index (LDI), a conceptual construct representing the dependence of users on wheelchair throughout the rehabilitation process. The LDI captures a continuum from 'resistance'—reflecting reluctance or emotional struggle in adopting wheelchair—to 'reliance,' indicating acceptance and integration of wheelchair into daily life. As a qualitative construct, the LDI was suggested through a thematic analysis. Accordingly, we presented the DAE diagram. This diagram illustrates the transformation of affective experiences throughout a planned rehabilitation timeframe. Finally, we justify the emergence of this dynamics.

2.2. A framework for understanding users' experience of wheelchairs

In this study, we adopted the widely used *product experience framework* introduced by Hekkert and Desmet (Desmet & Hekkert, 2007) to explore DAE in using wheelchair over time. This framework encompasses three layers of *aesthetic pleasure* (i.e., the degree to which all our senses are gratified), *meaning attribution* (i.e., the meanings we attach to the product), and *emotional response* (i.e., the feelings and emotions that are elicited through the product's usage). According to this framework, emotions are evoked through interactions with products when users appraise the products as beneficial or harmful to their concerns, linking sensory appeal and interpreted meanings to emotional outcomes. The *designing emotions* model (Desmet, 2002) was also taken to explore the emotional aspect of the wheelchair-user interaction. This model includes three components of *appraisal*, *concern*, and *product*. Users first assess a product's utility (appraisal), determine if it meets their emotional needs (concern), and if the product holds significance, it elicits a positive emotional response. The model emphasizes that while the connection between a product's appearance and emotions is not straightforward, emotions can be measured and designed for, contributing to a deeper understanding of product-user interactions.

In our study, adapted from these frameworks, individuals with mobility disabilities are considered as users and wheelchairs as products. It should be noted, the term "clients" is used as it reflects the participants' language, and therefore, "clients," "WUs" and "users" are used interchangeably. Aesthetic perception and evaluation represent the sensory pleasure during interaction with a wheelchair, and meaning attribution relates to users' interpretations of a wheelchair. The emotional response denotes the feelings and emotions evoked in users by a wheelchair. For WUs, these emotional responses can shape the DAE in using wheelchair, as the devices not only fulfil their functional needs but also resonate with their personal goals and aspirations, fostering a lasting attachment.

2.3. Development of interview guidelines and questions

Research team members initially conducted the relevant literature review and highlighted the key relevant aspects of the product experience framework (Desmet & Hekkert, 2007). The authors excluded the areas of engineering aspects and ergonomics, which focus more on physical interactions. To ensure study validity and rigor, we formed an expert panel consisting of the authors and two external members—a physiotherapist and an inclusive designer—both with extensive experience working with mobility disabilities. The expert panel acknowledged that contextual elements, such as cultural factors, personal beliefs, and social considerations, influence each phase. Accordingly, while participants may define ableism and perceive disability through a medical model that frames it as an undesirable individual deficit, the questions and results aim to capture the social and psychological aspects of disability (Johnston & Bonetti, 2001). Then, this panel facilitated the drafting of the IDI guidelines and questions. Finally, after unanimous agreement among authors, the final interview guide, detailing the sequence and content of questions, was approved. In English, some samples of the key questions were:

(1) How do clients feel and react when they are prescribed an MA for the first time?
(2) What factors influence clients to adopt or hinder their use of wheelchairs in daily routines? How do these factors shape their expectations of wheelchairs?
(3) How do clients perceive their wheelchairs and their environment? Are there any compatibility issues? How soon after using wheelchairs do they report any compatibility issues with their environment?
(4) How do clients perceive high-tech wheelchairs? Does this perception affect their decision to accept or refuse a prescribed wheelchair?
(5) How do clients feel after using wheelchair for several months? Which contextual factors (e.g., culture, society) most influence perceptions of disability and representation of wheelchairs?
(6) Do clients become aware of their rehabilitation progress and how they eventually discontinue using prescribed wheelchair?
(7) What factors encourage or discourage users from continuing to use wheelchairs? How do they compare their body before and after experiencing a disability challenge?

2.4. Participants

In this study, experienced physiotherapists were selected as participants for the IDIs. Their prolonged relationships with WUs and continuous monitoring during the rehabilitation process distinguish them from other caregivers, such as orthopedists and radiologists, who typically have shorter interactions with clients during medical visits. These physiotherapists were selected based on their extensive, direct engagement with WUs, which provides a unique perspective on the long-term affective experiences of these individuals. The inclusion criteria for participants were: 1) being registered as a physiotherapist in the Islamic Republic of Iran Medical Council (IRIMC), 2) a minimum of 5 years of experience in either the private sector or hospital physiotherapy wards, and 3) voluntary participation. Exclusion criteria included concurrent participation in studies related to the engineering and ergonomics of MAs development. As these studies primarily optimize direct user-wheelchair interactions, they may influence participants' responses, which should reflect the long-term affective experiences of WUs. A combination of purposive and snowball sampling techniques was used to recruit participants. Initially, physiotherapists with the required qualifications were approached through professional networks and clinics. These physiotherapists then referred colleagues who also met the criteria, thus expanding the participant pool. A total of 12 physiotherapists, all of whom were treating clients with physical disabilities, agreed to participate in the interviews. Given the study's aim to address themes with an anticipated moderate to high prevalence (e.g., over 40 %), a sample size of 12 is expected to provide adequate coverage. This calculation is based on the sample size needed, considering theme prevalence in the population and aiming for a 90 % probability of observing the desired number of instances (Fugard & Potts, 2015). The participants were not acquainted with the interviewers prior to the study, ensuring that the interviews remained unbiased. Table 1 provides further details on participant characteristics, including their professional background and the settings in which they treat WUs.

2.5. Data collection

Participants received an email before the interviews with an informational leaflet and invitation letter. The primary interviewer scheduled interview times and locations with participants one day in advance. Following this, interviews, lasting between 50 and 90 min, were conducted from March 2022 to February 2023 in participants' private clinics and public hospitals (physiotherapy wards) located in Kordkoy and Tehran, Iran. Upon obtaining written consent and signed confidentiality forms, interviews were recorded digitally with participants' consent, then transcribed, and anonymized. The interviews followed a semi-structured IDIs outline (Longhurst, 2009), allowing for open-ended responses while ensuring consistency across sessions. This format enabled participants to elaborate on their experiences while providing

Table 1
Background of participants and interview timing (N = 12).

Participant (P) #	Years of experience	Interview time (min)	Working experiences and profession category
P1	26	120	Private clinic, hospital & national medical committee of the Olympics
P2	25	85	Private clinic, welfare organization
P3	15	50	
P4	7	45	Home visiting
P5	13	85	Private clinic
P6	25	45	Private clinic, state welfare organization
P7	18	65	National medical committee of the Olympics, Private clinic
P8	19	70	Hospital
P9	21	80	Healthcare center
P10	17	60	Hospital
P11	23	75	Healthcare center
P12	25	60	Private clinic
–	S[a] = 234, A[b] = 19.5	S = 840, A = 70	–

[a] S: sum.

[b] A: average.

researchers with the flexibility to probe deeper into relevant themes.

The IDIs included targeted inquiries into clients' interactions with wheelchair at various stages of their rehabilitation. A comfortable environment was maintained to facilitate answering questions. Participants were given enough time to contemplate their perspectives and discussions persisted until data saturation was achieved. The study adhered to the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (Tong et al., 2007). Physiotherapists primarily shared experiences of adult WUs (>18 years) who required a wheelchair for a defined period due to conditions such as temporary spinal cord injuries, post-surgical recovery, or severe fractures (e.g., hip, pelvic, or lower limb). They did not differentiate between gender differences. Their insights were based on the rehabilitation experiences of approximately 410–500 users of wheelchair, closely monitoring their recovery progress. This number was derived from participant-reported data provided to the research team.

2.6. Data analysis

Audio recordings were transcribed within 48 h after each interview. Originally conducted in Persian, the interviews were translated into English and then anonymously reviewed and archived by two authors. To ensure translation accuracy, two authors—both native Persian speakers familiar with the culture and metaphors—collaborated with a native English-speaking author. After transcription and initial verification, the interview data were systematically analyzed using Braun and Clarke's inductive thematic analysis framework (Braun & Clarke, 2012). This approach involves six phases: familiarizing with the data, generating initial codes, identifying themes, reviewing themes, defining and naming themes, and producing a final report (Braun & Clarke, 2006). To ensure the rigor and credibility of the analysis, the transcriptions were reviewed with participants to verify the accuracy of their ideas. Transcripts were entered into Nvivo 12 for coding and sorting, and an initial codebook was created. The codebook was iteratively refined throughout the analysis process to ensure comprehensive coverage of the data and consistency in coding. This iterative refinement helped maintain analytical rigor and allowed emerging themes to be accurately captured. Two independent coders analyzed the transcribed interviews separately. Inter-coder reliability was assessed through regular discussions and consensus meetings, where coders compared their findings and discussed discrepancies. Authors applied both semantic and latent data interpretation strategies to identify broader themes (Braun & Clarke, 2022). This involved organizing, sorting, and examining coded excerpts for repetitions, similarities, differences, and gaps. Then, the codebook was refined through consensus to minimize subjective bias and ensure consistency in theme development.

Ultimately, the relevant quotes were selected, and findings were reported in alignment with our research question. The research team held weekly meetings during coding and analysis to discuss progress and agree on data interpretation. Reflexivity was maintained throughout the process, with researchers acknowledging their potential biases and actively reflecting on how these might influence data interpretation.

2.7. Ethics

The Human Research Ethics Committee approved the study (Certification Number: 30016116). Participants were informed about the study's objectives, gave written consent, and were allowed to withdraw at any time.

3. Results

The authors initially agreed on 44 codes, grouped into 6 clusters. These were then refined into four themes and two sub-themes, and further discussion consolidated them into three main themes. These themes represent the physiotherapists' perspective on WUs' interactions with their devices throughout the different stages of a planned rehabilitation process:

(1) Coping in Using the Wheelchair
(2) Reluctant Acceptance of the Wheelchair: Adjusting to the New Normal
(3) Approaching Recovery: Challenges in Over-reliance.

3.1. Theme 1: Coping in Using the Wheelchair

This theme addresses the challenges, presumptions, and expectations potential users face when starting to use the wheelchair. It primarily involves negative presumptions about self-disability and living with an MA daily. Subsequently, addressing the mobility issue, and integrating devices into daily routines for upholding independence and quality of life are secondary issues when clients think about a wheelchair (Table 2; Q1). Clients are often shocked when realizing they must use a wheelchair in daily life, both privately and publicly (Table 2; Q2). They often show a resistant reaction to using wheelchairs, even after purchasing the prescribed devices. They may even prefer to deny their disability or ask physiotherapists for an alternative rehabilitation method (Table 2; Q3). Users are not yet faced with physical environmental obstacles but are primarily confronted with negative stereotypes about mobility disabilities, with wheelchairs serving as iconic representations of these stereotypes in their mindsets (Table 2; Q2 and 4). During this period, individuals often react with anger or depression, comparing their current disabled state to their past abilities (Table 2; Q5). They may blame themselves for mistakes leading to mobility issues or attribute their condition to fate rather than realistic factors (Table 2; Q6). Here, clients' defensive approach to using wheelchairs prevents them from thinking about desired functionality or aesthetics—it is not a priority for them (Table 2; Q7).

Table 2
Participants supporting quotes on Theme 1: Coping in Using the Wheelchair.

Quote (Q) #	Illustrative quotes
Q1	*Once they[clients] find they need to use it, notions around the disability will be reminded.… They ask how people see them from now on.* *…They [clients] also consistently think about possible challenges that might be faced. And how all of these can be handled.*
Q2	*The first reaction is shock. They [clients] do not believe that they need to use a wheelchair from now on.…*
Q3	*They [clients] tend to ignore using a wheelchair or a cane, even after buying a wheelchair.… We [physiotherapist] need to persuade them that they must use it, otherwise, it may lead to a risky situation or delay the recovery.…* *Their primary concern is when will I get rid of this product [MAs or any kind of wheelchair]…. The first and most urgent question is how many days I [clients] should wear it (the brace). Is it possible to reduce this time with another activity? Is there any alternative option, instead of using a wheelchair?*
Q4	*They think that their wheelchair or cane reveals their disability and affects their friends, family, and themselves' perception. How others see me [as a patient] is very important.…*
Q5	*Their reaction is initially anger and finally yield.… They occasionally experience feelings of depression and even contemplate suicide.* *…Individuals may become depressed or react with anger.… It can depend on support from their environment, family, peers, and the encouragement or coercion they face regarding assistive device usage.* *Clients feel that they recently had all kinds of well-being routines (exercise, rest, makeup), but now this issue has become a disability.*
Q6	*They sigh. They believe that this [mobility disability] is a form of retribution and punishment for their past actions.…*
Q7	*At first, they [clients]do not consider the quality or design style of wheelchairs.… Their primary concerns revolve around their mindset regarding disability and the challenges of mobility disability, that considerably influence their state of mind.…*

3.2. *Theme 2: Reluctant Acceptance of the Wheelchair: Adjusting to the New Normal*

In this phase, clients reluctantly accept the wheelchair, fearing delays or risks to their rehabilitation without it (Table 3; Q7). They confront physical environmental obstacles for the first time, realizing the challenges of navigating mobility in environments while facing society's negative perceptions of WUs (Table 3; Q8). However, despite accepting the prescribed wheelchair, clients view them solely as functional devices, serving their practical purpose for mobility and nothing beyond that (Table 3; Q9). Over time, WUs become accustomed to their devices and focus more on tackling their physical and interactional challenges, rather than dwelling on initial presumptions (Table 3; Q10). Clients view physiotherapists as sources of knowledge who can provide encouragement and support to continue using wheelchairs (Table 3; Q11). Here, the emphasis on the functionality and aesthetic of the wheelchair becomes also heightened, since both influence the user's mobility and self-perception and society's reactions. For instance, powered wheelchairs are often preferred over manual ones due to their advanced technology for ease of mobility and futuristic appearance (Table 3; Q12). However, the cultural context, social values and the cause of disability can also significantly affect the user's perception and emotion and continued use of the wheelchair in public. Mobility disabilities from war injuries, such as during the Holy Defense[1] in Iran, are seen as heroic, while those from incidents like theft are associated with stigma and guilt (Table 3; Q13).

Table 3
Participants supporting quotes on Theme 2: Reluctant Acceptance of the Wheelchair: Adjusting to the New Normal.

Quote (Q) #	Illustrative quotes
Q7	*Finally, after resisting, they [clients] accept because they see that their health is in danger…. Their reaction is initially anger and finally yield.*
Q8	*In an environment where nothing is suitable for disabilities and all tools and equipment convey disability as an insult, feelings of shame and helplessness are greatly amplified and perpetuated for the users….* *…Clients easily explore such meanings and share their experiences at this stage with us [physiotherapist].* *Unfortunately, in our country mobility disability is seen as a stigma, which causes patients [users] to feel shy and embarrassed….*
Q9	*Clients think it [wheelchair] is temporary, so they consider it just for their functionality….* *They may consider it [MA] as an extra load and gadget on their body, which is just applicable to mobility.*
Q10	*It can be said that we observe a phenomenon of adaptability with the wheelchair or prescribed MA….There is a period when clients finally accept the products, yet still experience social and cultural challenges…. This stage may persist until full recovery is achieved.* *If you design the environment in such a way that all tools and accessories are considered for a disabled person, what is being expressed here is respect for disability. The disabled person will also understand this, and the given respect will make the acceptance of disability easier for them….*
Q11	*…However, we can encourage them to persist and continue to use it by offering support and empathy.* *They are very open and receptive to the treatment process and respond with, “I will use whatever you say”, when it is recommended….*
Q12	*…Products [MAs] should be designed to confer prestige rather than limitations. Therefore, they should depart from traditional norms and meanings, embracing advanced features instead.* *Technology can have a significant impact, ranging from 20 % to 40 %. Especially for those who resist using MA [wheelchair].* *The beauty of assistive products can influence client's preference by 30–40 %, which is significant. This is especially true for children and young people, where appearance matters a lot.*
Q13	*…Social, accessibility, and work environment issues, align with cultural differences, appearance [MAs] and clothing styles can affect the fit and perception of MAs, potentially exacerbating the patient's condition and reproducing the meaning of “I am a patient.” ….* *Owning a crutch or wheelchair from wartime, even if it's no longer necessary, serves as a heroic symbol for the individual – embodying qualities of courage, selflessness, and determination….*

3.3. *Theme 3: Approaching Recovery: Challenges in Over-reliance*

During this stage, clients frequently seek updates on the time of recovery from physiotherapists. They strive to mentally prepare themselves to achieve full recovery and abandon the use of the wheelchair. However, their reactions are two-fold: eagerness and happiness on one hand, and fear of leaving wheelchair on the other (Table 4; Q14). In this context, some clients may prefer to continue using wheelchairs, even after achieving full recovery (Table 4; Q15). Users have become emotionally and mentally attached to their wheelchairs, viewing them as a primary source of support. In other words, users sometimes prefer to continue using their wheelchairs with their limited functionality for daily activities, even after recovery (Table 4; Q16). Here, physiotherapists play an important role in persuading clients to discontinue use, reducing their reliance and emotional attachment to their wheelchairs (Table 4; Q17).

3.4. *Mapping the DAE and its influencing factors*

In the presented themes, it is impossible to pinpoint the exact duration of each phase due to the unique nature of individual's mobility issues and context. However, based on the introduced LDI, we can roughly illustrate the DAE in user-wheelchair interaction throughout a planned rehabilitation timeframe (Fig. 1). This figure is developed from thematic patterns in the interviews, illustrating the affective experiences of WUs described by physiotherapists. The vertical axis ranges from “Resistance” at the bottom to “Reliance” at the top, while the horizontal

Table 4
Participants supporting quotes on Theme 3: Approaching Recovery: Challenges in Over-reliance.

Quote (Q) #	Illustrative quotes
Q14	*As patients [clients] approach the end of rehabilitation, we observe a duality in their emotions…. Some [MA users] are excited, while others show fear and sadness.* *…They [clients] may become dependent and stubborn, accustomed to its presence, and still doubting their recovery.*
Q15	*Becoming accustomed to improper walking or malposition results in an awkward posture. However, the patient [client] grows used to it and even develops a kind of addiction to it.* *Sometimes, a client subconsciously may continue using the wheelchair out of despair, even if they have recovered….*
Q16	*…Despite any attachment to the wheelchair, the patient [clients] must be encouraged to transition away from it. Sometimes I [physiotherapists] see that women impose the disease on their partner.* *Actually, if they seek more emotional support, they may intentionally prolong the use of this device [MA]….*
Q17	*Now a person gets so used to that device that it becomes difficult to let go and move on without them…. We must now insist that it [leaving MA] is no longer dangerous.* *…It [continuous use of the MA] causes weakness. It causes an incorrect posture….* *Only a skilled psychologist can convince them [clients] to discontinue its use….*

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[1] The Iran-Iraq War was referred to as the “Imposed War” and the “Holy Defense” in Iran due to its perception as a defensive struggle against aggression (UChicago Library, n.d.).

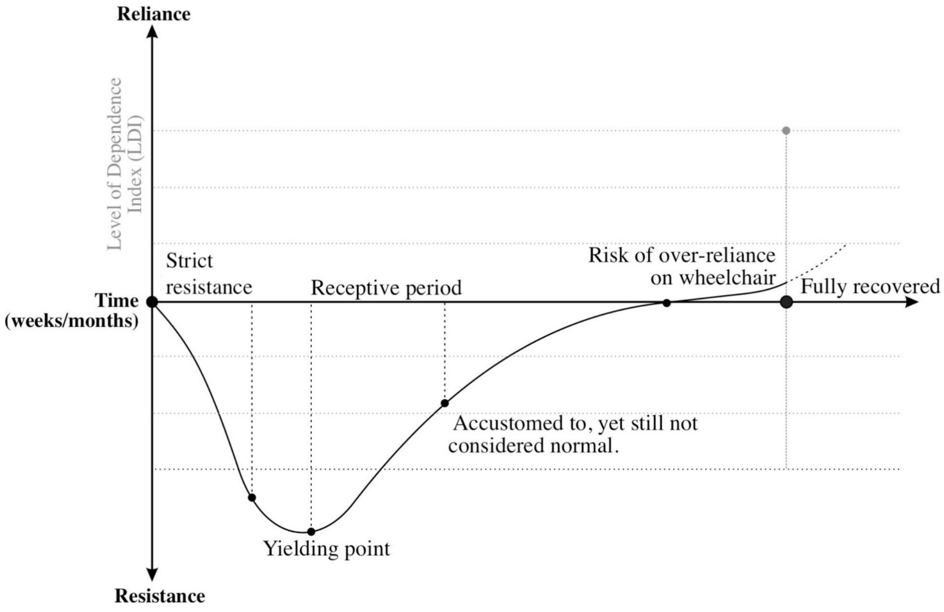

Fig. 1. Dynamics of affective experience (DAE) in user-wheelchair interaction during rehabilitation. ©Authors.

axis tracks progression over time. As DAE diagram shows, initially, clients enter a “Strict resistance” period, characterized by a refusal to accept the wheelchair due to contextual and emotional barriers. Over time, they reach a “Yielding point,” where resistance is at its lowest, indicating the beginning of acceptance. Following this, users enter a “Receptive period,” becoming more accustomed to integrating wheelchairs into daily routines and recognizing their practical benefits. Eventually, users become accustomed to wheelchairs but still do not view their usage as completely normal (i.e., “Accustomed to, yet still not considered normal”), achieving a sense of stability in acceptance without full satisfaction. As adaptation continues, users feel more connected to the wheelchair, and their reliance increases (i.e., “Risk of over-reliance on wheelchair”). Despite being “Fully recovered” and having the potential to abandon the use of wheelchair, they may still risk over-reliance on the wheelchair out of habit or perceived convenience, even after regaining mobility. While the overall pattern of the DAE remains consistent, the duration and intensity of each phase may vary among clients. These variations are influenced by social and contextual factors that indirectly impact their experiences.

In further exploring the emergence of DAE, as illustrated in the Fig. 1, two primary factors were identified in themes: Emotional importance (E) and Functional importance (F). Fig. 2 visualizes the progression of functional (line F) and emotional (line E) importance, as repeatedly noted in our qualitative data. This figure illustrates the flow of these factors in alignment with the phases of the DAE. The left-to-right progression captures users' shifts from “Strict Resistance” in the early stages to eventual “Full recovery” at the far right. Both lines begin at relatively low levels (i.e., “Strict resistance”) and increase as individuals become more involved with their wheelchairs, displaying similar upward trajectories but with key distinctions in timing and nuance. Initially, functional importance grows as users acknowledge the practical benefits of the wheelchair (i.e., “Receptive period”), while emotional importance increases from the “Yielding point” steadily, as users seek to experience wheelchairs in their social context. Functional

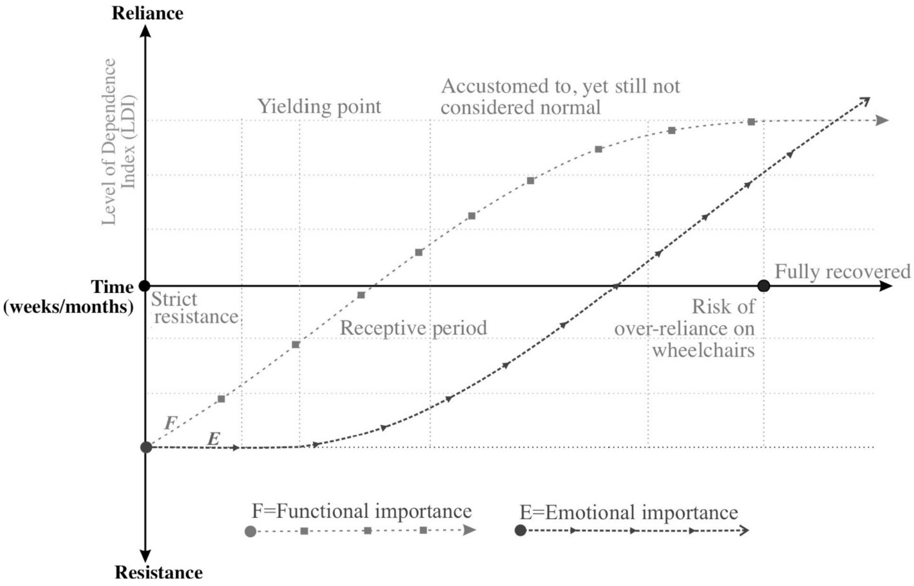

Fig. 2. The flow of emotional and functional importance in alignment with the phases of the DAE in using wheelchair. ©Authors.

importance stabilizes as recovery nears (i.e., "Fully recovered"), maintaining a consistent level. In contrast, emotional importance continues to rise even as recovery approaches. While we refrain from making broad generalizations about the DAE diagram presented (Figs. 1 and 2), recognizing that it may vary across different contexts and personal attitudes, it nonetheless represents a general pattern observed in our study, supported by the theoretical framework and relevant justifications. Both diagrams were reviewed and validated by the participating physiotherapists.

4. Discussion

In this section, each theme is interpreted, and their scope and connections with other themes are discussed. By justifying the identified themes, we can understand and track the user-wheelchair experience illustrated in the DAE diagrams. Additionally, we discuss how changes in emotional and functional importance shape the DAE. The provided themes and accompanying diagrams represent this study's unique contribution, addressing a gap in the literature concerning client DAE in using wheelchairs.

Themes indicate that the DAE with prescribed wheelchairs change over time, as emotional and functional priorities vary throughout the rehabilitation (Fig. 2). The DAE can also vary depending on cultural contexts, personal beliefs about disability, and health status, all of which can influence the length of each phase. Research shows that attitudes toward wheelchairs vary with time and health status, suggesting that a disabled person's attitude may be shaped by how they perceive the duration of their disability (temporary vs. permanent) (Antler et al., 1969). While previous studies on user-product interaction have highlighted changes in user experiences over the life cycle of products usage (Yoon et al., 2020) and provided models for assessing these experiences (Kujala et al., 2011), no studies have specifically tracked the experiences of WUs throughout rehabilitation. The DAE is particularly pronounced among WUs compared to users of other artifacts, as they constantly fluctuate between the duality of emotional and functional aspects. WUs hold negative presumptions and emotion about disability and using a wheelchair (Darling, 2019; Iezzoni et al., 2000), while simultaneously expecting mobility, physical comfort, independence, support, and functionality to meet their needs. The intensity of each factor justifies the flow of DAE.

During the initial phase, users encounter resistance stemming from negative stereotypes about disability, leading many individuals with significant mobility challenges to not identify themselves as disabled (Iezzoni et al., 2000). This perception persists until they come to accept the wheelchair (Mortenson & Miller, 2008). According to Desmet's Basic model of *designing emotions* (Desmet, 2002) users first, appraise the wheelchair's usefulness and value it based on its ability to meet their emotional needs. If the wheelchair (product) is seen as significant, a positive emotional response emerges (Mokdad et al., 2018). Based on Theme 1, users likely do not value the wheelchair emotionally, and the attributed meaning reinforces negative disability stereotypes. Previous studies also highlighted the impact of traditional notions about disability (Barbareschi et al., 2021; Resnik et al., 2009) and the stigma associated with wheelchair (Barbareschi et al., 2020; Saia et al., 2024). Accordingly, users show resistance to using wheelchairs or any MAs, due to perceived low emotional and functional significance. Particularly, the expected functionality of the prescribed MA is overshadowed by users' negative presumptions (attributed meaning) about wheelchairs (Desmet & Hekkert, 2007). Previous research has also confirmed that the initiation of wheelchair use can be psychologically distressing (Aho et al., 2018). However, as WUs acknowledge the practical benefits of the wheelchair, its functional importance increases, with emotional importance still taking a secondary role. This functional importance paving the way to the yielding point. In this context, healthcare professionals can play a key role during both the introduction and ongoing use of wheelchair (Aho et al., 2018; Rasoulivalajoozi et al., 2025b).

Users finally accept the wheelchair reluctantly, as refusal could result in declining mobility. During this phase, the functional importance continues to rise, while emotional importance begins to increase. As they enter the receptive period, users gradually become accustomed to the prescribed wheelchair, incorporating it into their daily lives. Consequently, functional importance plays a key role and is anticipated to increase steadily. Similarly, with the integration of the wheelchair—the *product*—into their social lives and mediated by its aesthetics and positive attributed meaning, emotional importance also grows as expected (Desmet, 2002; Desmet & Hekkert, 2007; Faraji & Valajoozi, 2014; Rasoulivalajoozi & Farhoudi, 2025). During the adjustment period, users employ wheelchairs but may not yet see their usage as completely normal. While the resistance stage is marked by reluctance, interaction becomes central during the adjustment phase. Accordingly, in this stage, any mismatch between users' expectations and the wheelchair's appearance and functionality can lead to emotional responses such as anger and frustration, potentially discouraging continued use (Barlew et al., 2013; Rousseau et al., 2012).

Here both the emotional and functional importance are expected to continue growing. This step continues until full recovery, where the physiotherapist advises stopping wheelchair use. As they approach the recovery point, the functional importance may stabilize since they have already improved their skills with the wheelchair in resolving mobility challenges. However, since users' social presence depends on their use of a wheelchair (Rasoulivalajoozi et al., 2025a), its emotional importance may continue to grow, potentially leading to over-reliance. This over-reliance may pose risks to rehabilitation and reduce motivation for physical activity when users eventually need to discontinue using the wheelchair. In addition, it can lead to several negative consequences, such as muscle atrophy, poor posture, and pressure sores (Requejo et al., 2015; Stephens & Bartley, 2018) due to insufficient physical activity. It also increases the risk of secondary issues, including barriers to social interactions and psychological impacts like feelings of loss, anxiety, or depression (Johnston & Bonetti, 2001; Rousseau-Harrison et al., 2011; Saia et al., 2024). For instance, over-reliance on the wheelchair can act as a barrier to social interactions, as WUs may avoid situations that require them to challenge their dependence or face stigma from others. Moreover, when users are encouraged or required to discontinue its use, they may experience a sense of losing a part of their identity or independence.

Studies show that some WUs, after long usage, consider the wheelchair an extension of their body (Blach Rossen et al., 2012; Costa et al., 2010). Consequently, their emotions regarding the wheelchair are closely tied to their feelings about their own body, therefore losing the wheelchair can feel like losing a part of themselves. This over-reliance can also stem from the sense of safety and security the wheelchair provides, especially in unfamiliar environments or when facing physical limitations. Additionally, the wheelchair may become a symbol of autonomy for users who might otherwise feel vulnerable in social settings, further deepening their attachment. These potential reasons align with previous research suggesting that wheelchairs can provide reassurance or stability, and may become intertwined with users' identity or sense of self (Darling, 2019). In such cases, the intermediary role of a third party, such as a physiotherapist, can impact the users' emotional attachment toward the prescribed wheelchair (Aho et al., 2018). They can facilitate a gradual transition from each phase of wheelchair use, setting clear rehabilitation milestones, and providing emotional support. In other words, physiotherapists can act as catalysts in balancing the emotional attachment between users and wheelchairs, influencing users' decisions regarding wheelchair use; overall, shaping a DAE characterized by active acquisition during the resistance period and active discontinuation as WUs approach recovery. This necessitates ongoing connections between physiotherapists and clients within a client-centered framework (Mortenson & Miller, 2008; Rasoulivalajoozi & Touir, 2023). Additionally, support from family and friends is helpful (Cucuzzella et al., 2024; Rasoulivalajoozi et al., 2025b), and empathetic conversations along with efforts to build inclusivity can further alleviate the emotional burden associated with the loss of wheelchair use. Research shows that understanding the experiences of people with disabilities and engaging in empathetic conversations can improve attitudes and enhance inclusivity (Matera et al., 2021; Rasoulivalajoozi et al., 2025b).

In terms of *product experience framework*, as users approach recovery, they still apprise the wheelchair as beneficial and as a source of security. Even if they no longer need the wheelchair for mobility, they remain concerned about potential risks associated with not using it. Consequently, their emotional responses during interactions with the wheelchair remain strong, making it difficult for them to stop using wheelchair. This is supported by studies noting users may develop psychological dependence on their wheelchairs due to the sense of security and comfort they provide (Morris et al., 2022). Additionally, users may become accustomed to the attention and care they receive while using the wheelchair (Martire & Schulz, 2007), fulfilling emotional needs. Inadequate guidance or support during rehabilitation can also lead to habitual wheelchair use, which is challenging to change (Gardner et al., 2023). Therefore, *product experience* and *emotional design frameworks* could provide a lens for the justifying DAE of WUs during the three phases of resistance, acceptance, and the end of a planned rehabilitation timeframe.

The understanding of DAE presented in this study highlights the complexity of emotional attachment to wheelchairs in the rehabilitation process. Rather than assuming that fostering attachment universally enhances rehabilitation, it is important to recognize that its impact is highly phase- and context-dependent. On the one hand, in the early stages of rehabilitation, a positive emotional bond with a wheelchair can serve as a powerful enabler, enhancing autonomy, confidence, and self-efficacy (Rasoulivalajoozi et al., 2025a). These factors not only enhance engagement in rehabilitation but also contribute to long-term physical and emotional well-being by reinforcing users' sense of agency and control over their mobility. On the other hand, emotional attachment can take a counterproductive form, particularly when it encourages an overreliance on the wheelchair at the expense of mobility progression. In such cases, attachment may inadvertently diminish motivation for continued physical improvement, reinforcing a cycle of dependence that restricts participation in both rehabilitative efforts and broader social and physical activities. This perspective highlights the need for individualized rehabilitation strategies that balance the benefits of emotional attachment with the imperative of sustained mobility development, ensuring that attachment functions as a facilitator rather than a barrier to long-term well-being. However, for a precise understanding of the underlying factors, we recommend further justification through theories related to the patient's psychology, as well as the necessity of longitudinal studies.

5. Conclusion

The study shows the DAE in using wheelchair during a planned rehabilitation timeframe. To this end, we identified three themes: (I) Coping in Using the Wheelchair, (II) Reluctant Acceptance of the Wheelchair: Adjusting to the New Normal, and (III) Approaching Recovery: Challenges in Over-reliance. Based on these themes, we presented the DAE diagram illustrating the stages of users' interaction with wheelchairs, each stage depicting unique perceptions based on the LDI (resistance-reliance) during rehabilitation. The duration of each stage varies depending on each case's therapeutic issues and context. Initially, clients experience shock and resistance toward using a wheelchair due to perceived low emotional and functional importance. Over time, both factors increase in parallel, with functional importance growing first, followed by the rise of emotional importance starting from the yielding point. Ultimately, as WUs approach full recovery, functional importance may stabilize, while emotional attachment continues to grow. This can potentially pose risks to mobility and rehabilitation due to the risk of over-reliance. In this context, physiotherapists can facilitate a balanced emotional attachment between users and wheelchairs, shaping a DAE marked by active adoption during resistance and active cessation as users approach recovery.

5.1. Limitations and future studies

This study focused on experienced physiotherapists as participants in the interview sessions, but their perspectives may not fully capture WUs' affective experience. Given the WUs undergoing rehabilitation are considered vulnerable participants, ethical constraints and the approved protocols prevented us from interviewing individuals with disabilities during this phase. However, future studies should include both physiotherapists and active WUs. We also recommend that future research conduct longitudinal studies. This approach will provide more detailed insights by continually monitoring the DAE in wheelchair use and its influencing factors of emotional and functional importance. This study lacks policy and design practice recommendations. Future research should apply these themes to develop effective interventions, particularly in training programs for physiotherapists and defining design criteria for enhancing environments and MAs. Finally, a literature review comparing our findings with existing research on user-product interaction can help develop a behavioral design framework for healthcare design specialists focused on MAs.

CRediT authorship contribution statement

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

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Institutional review board statement

The study was conducted in accordance with the Concordia Research Ethics Committee and approved by the Concordia University's Ethical Review of Human Subject Research policy (protocol code 30016116, February 18, 2022).

Disclosure

The authors confirm that the abstract and full-text of this research has not been presented at any other journal, symposiums, conferences, or events. The article's publication has been explicitly approved by the authors at the institution where the work was conducted. If accepted, the article will not be published elsewhere in the same form, in English or in any other language, including electronically, without the written consent of the copyright-holder.

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.

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Declaration of competing interest

The authors declare no conflicts of interest.

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Data availability

The authors do not have permission to share data.

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