From Workaround to Centerpiece: Translating Lived Experience into Perimenopause-Focused Menstrual Health Technologies

Marinja Principe[1][a], Stefanie Krohmann[1][b], Tobias Kowatsch[2,3][c] and Marcia Nißen[4,2][d]
[1]*Department of Informatics, University of Zurich (UZH), Zürich, Switzerland*
[2]*Institute of Implementation Science in Health Care, University of Zurich (UZH), Zürich, Switzerland*
[3]*School of Medicine, University of St.Gallen (HSG), St. Gallen, Switzerland*
[4]*School of Health Sciences, Eastern Switzerland University of Applied Science (OST), St. Gallen, Switzerland*

Keywords: Perimenopause, Menopause, Digital Health Technologies, Digital Women's Health, Menstrual Cycle Tracking Applications, Menstrual Health Technologies, Femtech, Lived Experience, User-Centered Design, Health Technology Design.

Abstract: Perimenopause is a prolonged and heterogeneous transition that can substantially affect health, well-being, and daily functioning, yet remains underrepresented in the design of Menstrual Health Technologies (MHTs). Existing MHTs often centre on fertility and contraception, offering limited support for midlife users and their changing needs. We foreground lived experience as a primary source of design insight, asking how individuals' experiences of perimenopause can be translated into design needs and guiding considerations for more supportive MHTs. Therefore, this work analysed an online questionnaire with N=100 participants aged 45–55, spanning premenopause, perimenopause, and postmenopause; the survey captured current use of MHTs, key challenges, and desired functionalities. We combined these data with a focused review of existing MHTs and the academic literature to derive design considerations, which were visualised in a prototype. Our results show that physical and mental health symptoms are among the most significant challenges and that participants need support to understand their bodies, make sense of fluctuations over time, and actively manage their experiences. We argue for designs that (i) destigmatize perimenopause, (ii) embrace heterogeneity rather than one-size-fits-all solutions, (iii) minimize effort in everyday use, and (iv) move beyond passive logging towards holistic, anticipatory support.

1 INTRODUCTION

Perimenopause, the transitional phase before menopause, typically begins in the mid-40s, with menopause most often occurring between ages 45–55 (Hoga et al., 2015; National Institute on Aging, 2024). It is a prolonged period of hormonal fluctuation that can substantially affect health, well-being, and quality of life for millions worldwide. Although most commonly experienced by cisgender women, it is not exclusive to them; transgender men and non-binary individuals may also go through this transition. Common physical symptoms (e.g., hot flashes, irregular cycles, sleep disturbance) intersect with emotional and social challenges, with tangible impacts on daily life at home and at work (World Health Organization, 2024; Tutia et al., 2019).

Despite this burden, perimenopause remains underrepresented in the design of menstrual–health technologies (MHTs) (Epstein et al., 2017; Pichon et al., 2022). MHTs are widely used to monitor health indicators and support self-management (Schantz et al., 2021), and, when users opt to share de-identified data, can help narrow the Women's Health Data Gap (World Economic Forum and McKinsey Health Institute, 2025). Menstrual-cycle tracking applications (MCTAs) can improve menstrual health literacy and body awareness (Levy and Romo-Avilés, 2019; Patel et al., 2024), yet dominant feature sets still centre fertility and contraception, offering limited support for midlife users (Epstein et al., 2017; Pichon et al., 2022). Emerging studies suggest that MHTs can assist during perimenopause (Andrews

[a] https://orcid.org/0009-0002-5699-7375
[b] https://orcid.org/0009-0006-5836-7499
[c] https://orcid.org/0000-0001-5939-4145
[d] https://orcid.org/0000-0002-6082-8825

Principe, M., Krohmann, S., Kowatsch, T. and Nißen, M.
From Workaround to Centerpiece: Translating Lived Experience into Perimenopause-Focused Menstrual Health Technologies.
DOI: 10.5220/0014452300004070
Paper published under CC license (CC BY-NC-ND 4.0)
In *Proceedings of the 19th International Joint Conference on Biomedical Engineering Systems and Technologies (BIOSTEC 2026) - Volume 1: BIOSIGNALS*, pages 614-628
ISBN: 978-989-758-802-0; ISSN: 2184-4305
Proceedings Copyright © 2026 by SCITEPRESS – Science and Technology Publications, Lda.

et al., 2021; Andrews et al., 2023a; Kim et al., 2024), but lived-experience research points to needs that go beyond symptom tracking alone (van Manen, 1997; McChlery, 2021). People seek trustworthy information about their changing bodies (McElhany, 2025; McChlery, 2021), support in adjusting to disrupted routines, and help navigating shifting perceptions of attractiveness and femininity (Marnocha et al., 2011). Together, this literature highlights a need to translate lived experiences of perimenopause into actionable design guidance for more supportive, perimenopause-aware MHTs.

This work addresses that gap by foregrounding lived experience as a primary source of design insight. Rather than treating perimenopause as a uniform clinical pathway, we approach it as a heterogeneous, situated experience and opportunity to scale up MHTs and ask: How can individuals' lived experiences of perimenopause be translated into design needs and guiding design considerations for more supportive MHTs?

We operationalise this guiding question through three subquestions:

- **RQ1:** How do individuals *currently experience* and manage perimenopause, and what challenges arise in using MHTs?
- **RQ2:** What *design needs* emerge from these experiences, and how can they inform the development of more supportive MHTs?
- **RQ3:** What *design considerations* can guide the development of MHTs that respond to these needs?

To answer these questions, we conducted an online questionnaire with $N = 100$ participants aged 45–55, spanning pre-, peri-, and postmenopause. The survey captured current use of MHTs, key challenges, and design needs. We combined these data with a focused review of existing MHTs and academic literature to derive design considerations, illustrated in a prototype. Physical and mental symptoms emerged as major challenges, alongside a strong need to understand one's body and actively manage experiences rather than merely log them. Accordingly, we recommend designs that (i) **destigmatize** perimenopause, (ii) **embrace heterogeneity** over one-size-fits-all solutions, (iii) **minimize effort** in everyday use, and (iv) move **beyond passive logging** toward **holistic**, anticipatory support.

2 BACKGROUND AND RELATED WORK

2.1 Perimenopause and Its Challenges

Perimenopause is the transitional phase before menopause, beginning with menstrual changes and ending one year after the final menstrual period (Pyne et al., 2024; World Health Organization, 2024). It typically starts in the mid-40s, with most people reaching menopause between ages 45–55; the transition commonly lasts 2–8 years (on average about 4) and may be longer for some (British Menopause Society, 2023; Mayo Clinic, 2024; National Institute on Aging, 2024). Clinically, frameworks such as STRAW distinguish early and late menopausal transition and postmenopause based on increasing cycle irregularity, hormonal fluctuation, and intermittent an-ovulation (Harlow et al., 2012; Santoro and Randolph, 2011; Santoro, 2016). Common symptoms across this period include vasomotor changes, cycle variability, sleep disturbance, mood shifts, and vaginal dryness, with consequences for health, well-being, and daily functioning (World Health Organization, 2024).

Lived experience is further shaped by cultural norms, work and family roles, and social narratives (Tutia et al., 2019; Lazar et al., 2019). Many report disruption at home and work (World Health Organization, 2024; Marnocha et al., 2011), yet only about one quarter seek care (McKinsey & Company, 2022). Stigma, limited education, and variable access contribute to unmet needs and isolation (Cowell et al., 2024; McElhany, 2025). Symptom prevalence and intensity vary widely across populations (e.g., vasomotor symptoms 3–86%) (World Health Organization, 2024). Overall, perimenopause is a heterogeneous, multi-dimensional transition that requires support for understanding, preparation, and day-to-day management, not only clinical treatment (Marnocha et al., 2011).

2.2 Existing Digital Solutions

Smartphone-based MHTs are widely used to track health indicators and support self-management (Schantz et al., 2021). They can improve menstrual health literacy and body awareness (Levy and Romo-Avilés, 2019), with a large user base among younger people (average user age $\sim$26; many start in adolescence) (Patel et al., 2024; Broad et al., 2022; Grieger and Norman, 2020). As these users age, established habits and longitudinal data create an opportunity to evolve MHTs into *lifelong companions* that also support perimenopause and menopause.

However, most leading MHTs remain fertility-centric, emphasising ovulation, cycle regularity, and conception while under-serving life-stage transitions such as perimenopause (Fox and Epstein, 2020; Pichon et al., 2022; Chowdhury and Sultana, 2025). Although Clue (https://helloclue.com/) and Flo (https://flo.health/), two of the most downloaded MHTs (Statista, 2025), have begun to add perimenopause-oriented features (e.g., symptom tracking, adaptive views, exportable reports), their scope remains limited (Flo Health Inc., 2025; McGee, 2023). This gap persists despite evidence that perimenopause-focused apps can reduce symptom burden, improve communication with clinicians, and support health behaviours (Andrews et al., 2021; Andrews et al., 2023a; Andrews et al., 2023b; Kim et al., 2024).

Extending existing MHTs, rather than asking users to adopt separate perimenopause apps, offers a complementary approach. Longitudinal data and established routines can enable continuity and personalisation across life stages (Grimme et al., 2024; Lopez Burst et al., 2024), and users already engaged before perimenopause may be more likely to sustain use and recognise changes earlier (Lopez Burst et al., 2024).

3 METHODOLOGY

This work draws on human-centred design (National Institute of Standards and Technology, 2024) to foreground the lived experiences (van Manen, 1997) of individuals navigating perimenopause and translate their challenges into design considerations for MHTs. We conducted an online questionnaire ($N = 100$) in which participants reported their challenges and how MHTs could support them. Our analysis proceeded in three stages:

1. Descriptive analysis of how participants *currently use* digital health applications during perimenopause and how they rate existing app features, complemented by thematic analysis of open-ended responses to surface *everyday challenges* and limitations in current solutions (RQ1).
2. Extension of the thematic analysis to identify recurring support needs and expectations for future technologies, synthesised into *design needs* grounded in lived experience (RQ2).
3. Integration of these needs with relevant literature to derive high-level *design considerations* and concrete recommendations, illustrated with interface sketches from an existing prototype (RQ3).

This multi-step approach provides a transparent link between participants lived experiences and design considerations for digital women's health technologies.

3.1 Participants and Recruitment

Participants were recruited via the online research platform Prolific (https://www.prolific.com/). Eligibility was defined using Prolific's screening tools and required: (i) age 45–55 years, (ii) legal sex recorded as female in official documents, and (iii) current residence in the United Kingdom or the DACH region (Germany, Austria, Switzerland).

We obtained a geographically balanced sample of $N = 100$ participants, with 46 from the UK and 54 from the DACH region. Recruitment was stratified by region using separate Prolific studies with quotas, and the questionnaire was offered in German and English. We initially opened 60 places for DACH participants (54 completed) and then 46 places for UK participants (all completed).

Participants' ages ranged from 45 to 55 years ($M = 49.25$, $SD = 3.26$). Most ($N = 66$) self-identified as currently in perimenopause (self-assessed or medically confirmed); the remainder reported being postmenopausal ($N = 15$), unsure of their status ($N = 11$), or neither ($N = 8$). All participants provided informed consent and received monetary compensation in line with Prolific's fair pay guidelines (Prolific, 2025). Further demographic and menopausal status details are provided in Table 1.

3.2 Data Collection and Analysis

Data were collected via an online questionnaire hosted on LimeSurvey (https://www.limesurvey.org/) and deployed on a secure institutional server. The survey remained open until predefined quotas were reached. It combined open- and closed-ended items on participants' experiences with perimenopause and MHTs, including current technology use, lived challenges, perceived support needs, and the perceived usefulness of selected features.

To assess technology use, we asked whether participants had ever used, or were currently using, MHTs to support perimenopause and which challenges they encountered. To contextualise responses, we conducted a focused review of MHTs and menopause/perimenopause apps, drawing on media reports (Atkins, 2023; Ogle, 2024), academic literature (Sillence et al., 2023; Paripoorani et al., 2023), and app-store listings (Statista, 2025). We screened the app descriptions and, where available, websites to identify user-facing functionalities. For each app, one researcher documented the reported features and the

Table 1: Sample characteristics of participants ($N = 100$).

Characteristic	n
Age	
Range	45–55 years
Mean (SD)	49.25 (3.26)
Country of Residence	
United Kingdom	46
Germany	46
Switzerland	3
Austria	5
Gender Identity	
Woman	96
Non-binary / Genderfluid / Other	3
No response	1
Ethnic Background	
White	88
Black	2
Asian	2
Hispanic / Latin American	1
Mixed / Multiple backgrounds	5
Prefer not to say	3
Menopausal Status	
In perimenopause	66
– medically confirmed	23
– self-assessed	43
Postmenopausal	15
– medically confirmed	11
– self-assessed	4
Neither peri- nor postmenopausal	8
Unsure	11

wording used to describe them, and then grouped similar functionalities into higher-level *feature categories* (e.g., merging overlapping labels used across apps). Category names and boundaries were iteratively refined to ensure they were distinct. This initial set was extended with categories reflecting lived experiences commonly reported in perimenopause research (e.g., anxiety, disrupted routines, and changes in self-perception), operationalised through features such as daily wellness check-ins and stress-management tools (Marnocha et al., 2011; McElhany, 2025). A second researcher reviewed the resulting feature categories and descriptions for plausibility and clarity; feedback informed minor refinements. This process resulted in 11 feature categories, which participants rated on a 5-point Likert scale and then indicated which they considered most important. Responses were linked to participants' Prolific IDs solely for compensation, rendering data pseudonymised; all data were handled in accordance with GDPR, and the study received an exemption from formal review by the Ethics Committee of the University of St. Gallen.

Data analysis combined descriptive statistics and inductive thematic analysis. Closed-ended items were analysed descriptively (frequencies and summary statistics). Open-ended responses were analysed inductively following Braun and Clarke's approach (Braun and Clarke, 2006). One researcher conducted repeated familiarisation with the dataset and generated initial data-driven codes across all responses. Coding was iterative: codes and their definitions were refined over multiple passes as new patterns emerged, and earlier responses were revisited to ensure consistent application. Codes were then clustered into candidate themes, which were reviewed against the original responses, refined through merging/splitting and finalised with clear theme definitions and representative excerpts. To strengthen analytic rigor, a second researcher reviewed the codebook and resulting theme structure for plausibility and coherence. Themes were subsequently translated into overarching design needs, which were synthesised with Human-Computer Interaction (HCI) and digital women's health literature to derive four design considerations and corresponding recommendations.

4 RESULTS

This section presents our results in line with the three research questions: (RQ1) how participants experience and manage perimenopause and currently use MHT; (RQ2) the resulting design needs for more supportive technologies; and (RQ3) corresponding design considerations and recommendations. We illustrate RQ3 with prototype screens from a native iOS (Apple) app we developed as a research demonstrator to show how these considerations could be operationalised in an interactive system. Together, the design considerations and prototype examples link participants' lived experiences to actionable principles for future digital women's health tools.

4.1 Lived Experiences and Digital Challenges of Perimenopause

To better understand lived experiences and current challenges, we asked participants (1) how they use MHT, (2) which features they prioritize, and (3) which challenges they personally struggle with during perimenopause.

4.1.1 Current Use of Technologies

Tracking was common: most participants ($N = 62$) reported monitoring cycles or symptoms using analogue or digital tools. Around half of them ($N = 31$) used a physical or digital calendar, while 25% ($N = 25$) participants used MHTs. However, only few reported using perimenopause-specific apps or wearables.

Considering past use, over half of participants ($N = 52$) had used MHTs at some point, but 18% ($N = 18$) had discontinued. The main reasons were that tracking no longer felt necessary (44.4%, $N = 8$), limited usefulness for perimenopausal symptoms (22.2%, $N = 4$), privacy concerns (16.7%, $N = 3$), and frustrations with irregular cycles or data management, indicating a mismatch between existing tools and the lived complexity of perimenopause.

4.1.2 Feature Preferences and Gaps in Support

To further understand what kinds of digital features participants value, the survey presented a set of 11 candidate features derived from a focused review of existing peri- and menopause apps (for more information see Section 3.2). Each feature was rated on a 5-point Likert scale (1 = *Not helpful*, 5 = *Very helpful*). These ratings helped reveal which functionalities participants considered most beneficial for perimenopausal self-management.

As shown in Figure 1, **symptom tracking (F1)** was rated the most valuable feature overall, followed closely by **personalised insights (F2)** and **cycle and symptom predictions (F3)**. These preferences indicate a strong desire for tools that move beyond simple data collection to provide meaning, interpretation, and foresight, core functions that could support users in understanding and managing bodily changes.

Mid-ranking features, such as **wearable integration (F4)** and **educational content (F5)**, highlight an interest in convenience and learning, though these were seen as secondary to tracking and interpretation. Lower-ranked features, including **clinician connection (F10)** and **community forums (F11)**, suggest that users prefer private, self-directed forms of support rather than social or externally mediated engagement.

4.1.3 Thematic Challenges Reported by Participants

To better understand specific challenges, participants were asked to describe the most significant challenges they were experiencing during perimenopause. All participants who reported currently being in, or having previously experienced, perimenopause ($N = 81$) were included in this analysis. Open-ended responses were analysed using thematic analysis, resulting in the categorisation of 197 total coded mentions across 39 distinct subcategories. These were grouped into seven overarching themes seen in Table 2.

Physical symptoms were the most commonly reported category, with 85 coded mentions across 17 distinct subtypes. Participants frequently described hot flushes, sleep disruptions, joint pain, fatigue, and weight gain.

Mental health concerns were also prevalent (61 mentions), with participants referencing mood swings, anxiety, brain fog, irritability, and depression.

Menstrual health challenges (30 mentions) included irregular periods, heavy bleeding, and cycle unpredictability, all common yet distressing symptoms during perimenopause.

Social and emotional impacts (10 mentions) reflected experiences of stigma, isolation, and uncertainty, often linked to a lack of accessible information and societal silence around perimenopause.

Medical and treatment-related challenges (4 mentions) included frustration with unqualified providers, lack of hormonal treatment access, or unclear guidance about therapies.

A small group of participants ($N = 5$) explicitly reported experiencing **no symptoms**, while two others described challenges that fell outside the main categories (e.g., financial strain or lifestyle disruptions), grouped under **Others**.

This thematic overview demonstrates the complex and multifaceted nature of perimenopausal experiences, and highlights the need for support tools that address not only physical symptoms but also emotional, informational, and medical dimensions of care.

4.2 Design Needs for Digital Support During Perimenopause

To better understand how MHTs might support people during perimenopause, participants were asked to describe what kind of technological assistance they would find most valuable. Open-ended responses ($N = 98$) were analysed thematically and grouped into seven overarching need categories, as seen in Table 3.

Understand. The most frequently expressed need ($N = 75$) was help in understanding bodily changes. Participants wanted tools that interpret new or unfamiliar symptoms, provide trustworthy information, and reduce uncertainty, helping them feel more in control and less anxious during this transition.

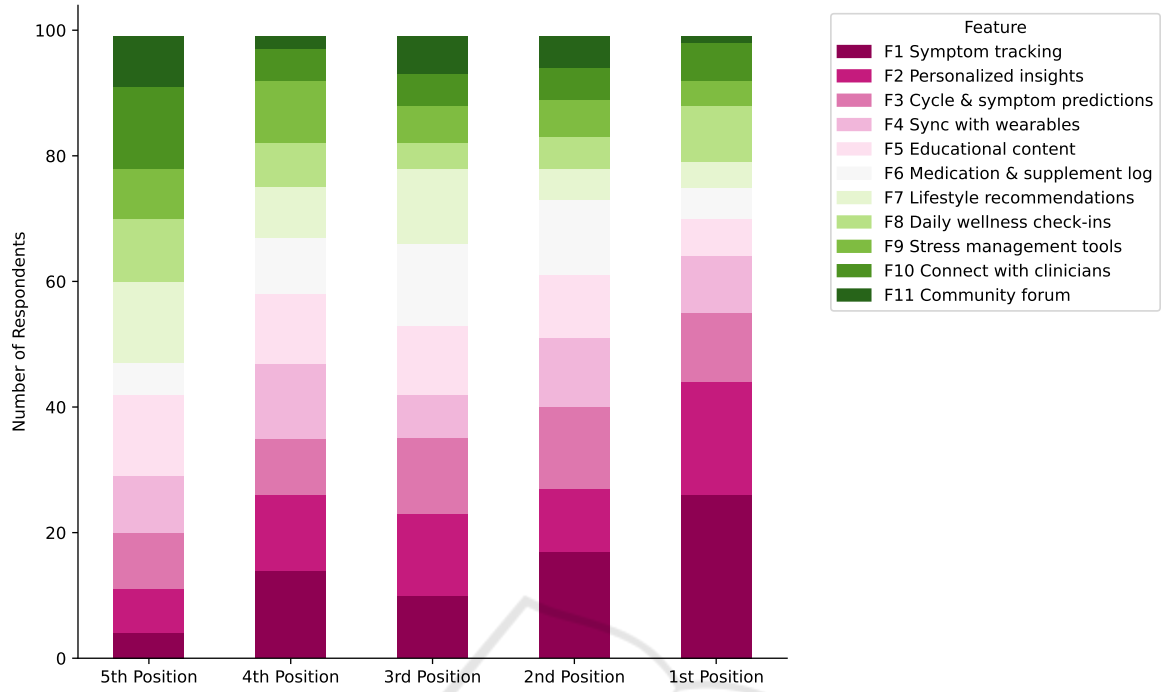

Figure 1: Distribution of helpfulness rankings for menstrual and perimenopause-related app features (valid responses: $N = 99$; one participant did not answer). Bars show how often each feature (F1–F11) was placed in participants' top-five rankings; pos1–pos5 indicate ranking position (pos1 = highest-ranked/most helpful; pos5 = fifth).

> *"Might ease anxiety if they could explain common symptoms - as in, nobody's dying, it's a normal change."* — **P1**

> *"Digital solutions can make understanding and managing the transition to perimenopause easier by providing personalized data, guidance and support."* — **P4**

> *"They could offer a lot of information, all in one place. That way we can learn more easily about perimenopause."* — **P33**

Manage. The second most common need ($N = 58$) concerned managing day-to-day challenges. Participants wanted tools to identify symptom patterns, offer actionable suggestions, and support self-care routines, for example lifestyle recommendations, help anticipating fluctuations, visualisations of symptom changes, and lightweight reminders for medication or wellness practices.

> *"It might show if there is any pattern to my bleeds and whether any other symptoms are associated. E.g. is joint pain or low mood related to bleeds."* — **P60**

> *"It could give me suggestions on what to do to better manage my symptoms so that it is less uncomfortable."* — **P90**

Track. Forty-five participants expressed a need for structured digital tracking of symptoms, moods, medications, and cycle changes. They stressed quick, easy logging to support routine use, reduce cognitive effort, and reveal patterns that help them gain clarity, manage fluctuations, and communicate experiences more effectively.

> *"There are so many perimenopause symptoms that having a quick way to record them on a day-to-day basis would be helpful to then hopefully highlight patterns."* — **P83**

Prepare. Twenty participants highlighted a need to prepare for upcoming changes. They wanted earlier, clearer information about what to expect physically and emotionally, along with tools that offer

Table 2: Overview of reported perimenopausal challenge categories ($N = 81$). Multiple challenges per participant were possible.

Category	# Subcategories	Total Mentions	Individuals Reporting	Example Subcategories
Physical Symptoms	17	85	41	hot flushes, sleep issues, pain, weight gain
Mental Health	9	61	33	mood swings, anxiety, brain fog, depression
Menstrual Health	3	30	24	irregular periods, heavy periods, cysts
Social & Emotional Impact	5	10	9	stigma, uncertainty, lack of information
Medical & Treatment	3	4	4	unqualified doctors, HRT reminders
Others	2	2	2	financial issues, lifestyle changes
No Symptoms	1	5	5	no reported difficulties
Total	39	197	—	—

anticipatory guidance, flag potential transitions, and support proactive planning to reduce uncertainty and distress.

> *"I wish someone could communicate the symptoms earlier so that I am prepared. I think the cycle tracking app should start communicating to women in their 40s about the symptoms of perimenopause and menopause and what to do in order to counter the symptoms earlier."* — **P15**

> *"It could help suggest you may be in perimenopause."* — **P72**

Reassure. Seventeen participants emphasised a need for reassurance, knowing whether their experiences were typical and feeling less isolated. Beyond factual information, this reflected emotional uncertainty and a search for validation. For some, reassurance meant clear guidance on expected symptoms and when to seek care; for others, normalising their experiences and knowing they were not alone or "going mad."

> *"Help me know what will happen and what is normal and what is not normal."* — **P55**

> *"It might help me feel less alone in what I'm going through."* — **P90**

> *"Some reassurance that if you feel crappy it's not 'cause you're old or going mad. Your hormones are whacko."* — **P94**

> *"You can understand that what you are feeling is normal and happens to others."* — **P97**

Communicate. Sixteen participants wanted better ways to communicate their experiences to clinicians, family, and peers. They sought tools to clearly articulate symptoms, make invisible experiences more legible, and foster shared understanding and support in both medical and personal contexts.

> *"A greater understanding by medical experts and wider knowledge to support people and family members too."* — **P99**

> *"Allowing summaries to be shown to [my partner] so he can support me better."* — **P100**

Personalize. Finally, ten participants wanted tools that reflected their unique experiences rather than a one-size-fits-all model, acknowledging individual variation in symptoms, goals, and progression through perimenopause and adapting accordingly.

> *"It would help by explaining and informing on symptoms and what should be expected since it can be somewhat different for everyone."* — **P40**

Table 3: Overview of support needs reported by participants ($N = 98$).

Need Category	Participants (n)	Description
Understand	75	Support understanding of bodily changes, symptoms, and the overall perimenopausal process.
Manage	58	Help users manage physical and emotional experiences in daily life.
Track	45	Enable tracking of symptoms, mood, cycle changes, and other lived experiences.
Prepare	20	Assist users in anticipating what to expect during the transition to menopause.
Reassure	17	Provide reassurance by normalising experiences and reducing feelings of isolation.
Communicate	16	Facilitate sharing of experiences with healthcare providers, family, or peer communities.
Personalise	10	Offer personalised insights that reflect individual differences rather than generalisations.

4.3 Design Considerations and Recommendations for Perimenopause-Focused Technologies

Drawing on participants' design needs (Section 4.2) and prior work in digital women's health, and HCI, we derived four cross-cutting *design considerations* for digital perimenopause support. While design needs capture concrete user goals (e.g., tracking symptoms, preparing for changes), design considerations are higher-level principles that translate these goals into product strategy, bridging lived experience and system design.

4.3.1 Designing for Destigmatization

The design should normalize perimenopause by framing it as an ordinary life stage and fostering respectful, stigma-free discourse.
Addressed support need(s): **Understand**, **Personalize**, **Reassure**, **Communicate**.

Empirical Grounding. Participants repeatedly framed destigmatisation and normalisation as central needs. Stigma and dismissive or underprepared clinicians were cited as key challenges, shaping what they wanted from MHTs: support to **understand personal** bodily changes, **reassurance** that experiences are typical rather than pathological or isolating, and channels to **communicate** with clinicians, family, and peers without shame. As one participant noted:

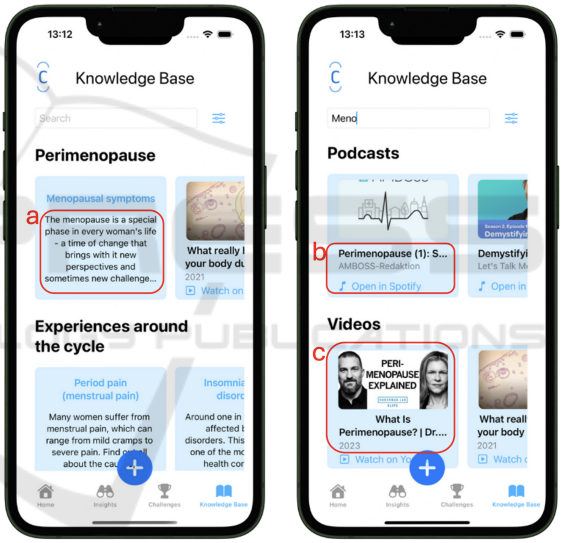

Figure 2: Example of translating knowledge through positive framing.

> *"It's a bit depressing and makes me feel old."* — **P94**

Context from Prior Work and Current Ecosystem. Perimenopause is often framed in deficit terms, loss of fertility, attractiveness, or emotional stability, fueling shame and marginalisation (Dahlgren et al., 2023; Lazar et al., 2019; Chopra et al., 2024). Such narratives cast the menopausal body as undesirable or "in decline", undermining agency and well-being (Keyes et al., 2020; Mahady et al., 2008). Our data reflect this "double stigma" (O'Reilly et al., 2024), where age-related taboos intersect with mood and cognitive changes:

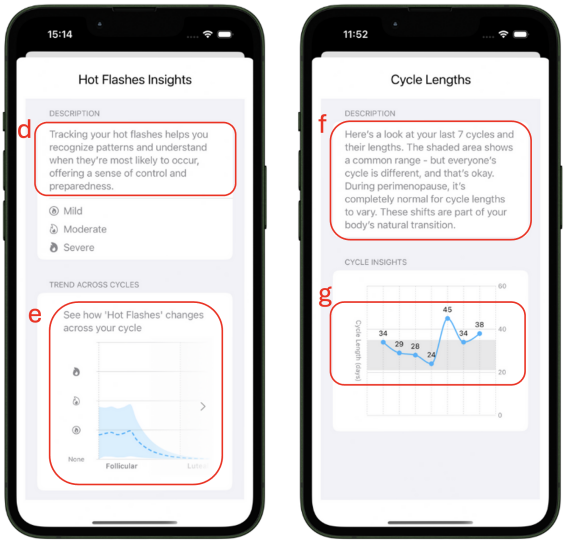

Figure 3: Example of personalised, reassuring insights.

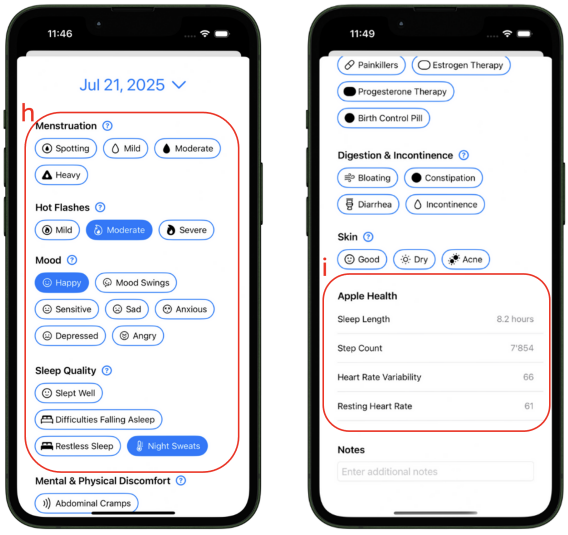

Figure 4: Example of heterogeneous symptom tracking.

> *"The lack of information and the fact no one talks about it, or when they do it's jokingly or eye-rolling is frustrating."* — **P29**

> *"We need to talk more about and support women's health! Period! Even amongst women it is sadly not one of our favorite topics to discuss."* — **P40**

Riley et al. show that MHTs can reduce internalised stigma by building self-knowledge and agency (Riley and Paskova, 2022); extending this to perimenopause could help normalise discussion and reduce shame.

Recommendation for MHTs. To counter stigma and align with user needs, perimenopause-focused MHTs should:

- **Neutral, affirming tone** (**Reassure**:) use inclusive language that frames perimenopause as a normal life stage (Figure 2a, 3d).
- **Contextual reassurance** (**Understand** & **Communicate**:) embed concise "what's typical / when to seek care" guidance within tracking and insights, with clear routes to clinical support (Figure 3e).
- **Visible diversity** (**Reassure** & **Personalise**:) depict varied bodies, life stages, and cultures, and allow personalisation so users see their experiences reflected.
- **Positive framing** (**Reassure** & **Understand**:) emphasise agency, self-knowledge, and community rather than loss or decline (Figure 2a).
- **Optional, moderated communities** (**Communicate**:) offer opt-in, well-moderated peer spaces that foster validation while limiting misinformation and alarmism (Figure 2c).
- **Transparent content governance** (**Understand** & **Reassure**:) disclose evidence sources, clinical review, and update policies; clearly signal clinician-reviewed content to foster trust (Figure 2b).

4.3.2 Designing for Heterogeneity

Design should embrace heterogeneity with flexible, inclusive choices and language, enabling each user to tailor the system to diverse symptoms, contexts, and interests.
Addressed support need(s): **Personalise**, **Manage**, **Track**.

Empirical Grounding. The wide variety of reported challenges shows how heterogeneous perimenopause is, spanning multiple categories beyond physical symptoms. Participants therefore expressed a strong need to understand their **personal** perimenopausal experience and to **manage** both mental and physical aspects (e.g., pain, lifestyle adjustments, medication). Many preferred using MHTs to **track** symptoms, via both active self-report and passive wearable data, rather than relying on manual logs. However, they noted that existing MHTs often overlook perimenopausal experiences or focus only on well-known symptoms (e.g., hot flashes), with limited support for custom symptoms or medication entries.

Context from Prior Work and Current Ecosystem. Perimenopause is highly heterogeneous, shaped by personal, cultural, and social factors (Namazi et al., 2019; Chadha et al., 2016). Symptom profiles, interpretations, and help-seeking differ with healthcare access, norms, education, and lifestyle (Pyne et al., 2024). As Backonja et al. argue, technologies for menopausal care should therefore reflect diverse lived experiences rather than narrow, normative representations (Backonja et al., 2021). Our participants echoed this:

> *"Don't put us all into one box as everyone is different and with different symptoms."* — **P97**

On the other hand, ignoring sociocultural variation can marginalise underrepresented groups and reduce engagement (Pyne et al., 2024). Inclusive design thus requires rejecting one-size-fits-all models and treating variability as a core design principle, with participatory approaches offering ways to co-create tools that adapt to diverse needs (Lopez Burst et al., 2024).

Recommendation for MHTs. Designing for heterogeneity means building adaptability into the core system:

- **Flexible symptom vocabularies** (**Track** & **Personalise**:) include common and less-discussed symptoms, with options for custom entries and medication/context notes (Figure 5k).
- **Personalised configuration** (**Personalise**:) let users select, reorder, and filter features (e.g., mental vs. physical focus) and adjust notification frequency and detail (Epstein et al., 2017) (Figure 5k) .
- **Inclusive onboarding** (**Manage**:) offer adjustable defaults and brief, context-sensitive education tailored to life stage and background.
- **Visual and linguistic inclusion** (**Personalise**:) use culturally sensitive imagery and region-appropriate terminology; avoid narrow assumptions about gender, age, or bodies (Epstein et al., 2017) (Figure 3f).
- **Evolving user pathways** (**Manage** & **Track**:) adapt insights and prompts as needs change across perimenopausal phases (Nature Medicine, 2024; Lassi et al., 2025).

4.3.3 Designing for Everyday Realities

Design should minimize effort and disruption, enabling low-friction engagement that fits the complex routines of midlife users.

Addressed support need(s): **Manage**, **Track**, **Communicate**.

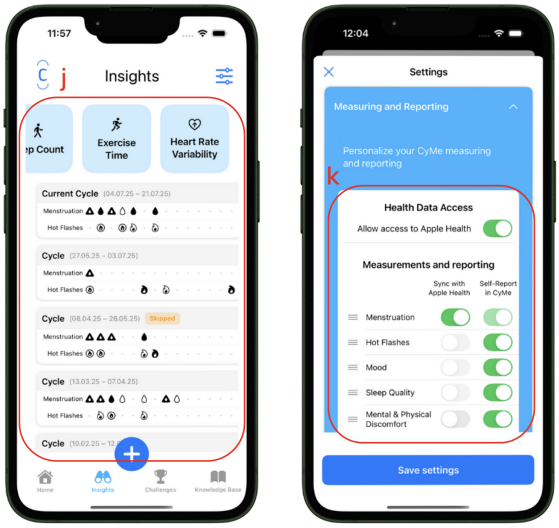

Figure 5: Example of customizable insights and symptom tracking, with options for manual entry or wearable integration.

Empirical Grounding. Participants reported that physical, mental, and menstrual symptoms were among their most pressing challenges, creating a strong need to **manage** symptoms and **track** patterns with minimal effort. Many wanted help **communicating** symptoms to others, especially clinicians and family, so that support would be timely and appropriate. As one noted:

> *"It affects me while I am at work and having my male boss understand I am not pretending to be unwell."* — **P97**

Context from Prior Work and Current Ecosystem. Perimenopause often coincides with demanding work, parenting, and caregiving roles, while users navigate fluctuating physical and emotional states (Backonja et al., 2021; Hardy et al., 2019; Hickey et al., 2017). This reduces bandwidth for self-care and increases the burden of symptom management. Prior work suggests midlife health technologies should be unobtrusive, effort-light, and adaptable to different contexts (private vs. shared, active vs. passive, home vs. mobile) (Backonja et al., 2021; Lopez Burst et al., 2024). Family changes and emotional labour further shape symptom interpretation and support-seeking (Hoga et al., 2015); tools that demand constant attention or add friction are unlikely to be adopted or retained.

Recommendation for MHTs. Designing for everyday realities means minimising cognitive and interaction load:

- **Quick, intuitive logging** (**Track**:) support one-tap entries and micro-check-ins (<1 minute), defaulting to minimal input (Figure 4h) (Krug, 2000; Nielsen, 1994; Mylonopoulou, 2018; Choe et al., 2014).
- **Passive and multi-device capture** (**Track**:) sync with wearables and phones for discreet, hands-free data collection across contexts (Figure 4i) (Li et al., 2011).
- **Context-sensitive summaries** (**Manage**:) offer "snackable" insights for busy days, with deeper trends on demand (Figure 5j; 3d–g) (Backonja et al., 2021; Case, 2015).
- **Discreet modes** (**Communicate**:) provide privacy-preserving UI (neutral name/icon, customisable notifications) for work and public settings (Epstein et al., 2017).
- **Effort-aligned reminders** (**Manage**:) use gentle, adjustable nudges that support routine without becoming intrusive (Case, 2015).

4.3.4 Designing for Anticipatory Care

Design should move beyond passive logging to anticipate *needs and promote holistic well-being.*
Addressed support need(s): **Prepare**, **Understand**, **Manage**.

Empirical Grounding. Participants described pronounced social and emotional impacts, especially uncertainty, which heightened their need to **understand** what is happening during this phase and to **prepare** for what may come next. They also wanted help to **manage** changes holistically, spanning lifestyle adjustments, complementary approaches, and conventional medication. As one participant put it:

> *"A holistic approach would be very nice, not just pure data and symptom tracking."* — **P18**

Context from Prior Work and Current Ecosystem. Much of today's perimenopause MHT landscape focuses on tracking (apps, wearables, manual logs) but often stops short of helping users interpret or act on their data, leaving them data-rich but insight-poor (Backonja et al., 2021; Homewood, 2018). Recent work calls for predictive insight, early warnings, and proactive support (Backonja et al., 2021; Lazar et al., 2019; Bardzell et al., 2019). Combining sensor data with self-reported symptoms could enable personalised projections and timely nudges, framing menopause as a life stage to be anticipated and understood rather than feared, in line with feminist HCI's focus on agency and care (Bardzell et al., 2019).

Recommendation for MHTs. To move from passive logging to anticipatory care, embed interpretation and foresight into the core:

- **From logs to insights** (**Understand**:) turn tracked data into clear trends and short-term projections (e.g., "mood dips often follow poor sleep") (Figure 3d–g).
- **Just-in-time prompts** (**Manage**:) offer optional, goal-aligned suggestions (e.g., wind-down reminder) when patterns suggest they may help.
- **Holistic integration** (**Understand** & **Manage**:) combine self-reports with wearable/contextual signals (sleep, stress, heart rate) to refine feedback (Figure 4i).
- **Gentle escalation cues** (**Prepare**:) flag patterns that may merit attention and provide calm guidance on when/how to seek care, avoiding alarmism (Case, 2015) (Figure 3g).
- **Boundaries and privacy controls** (**Prepare** & **Manage**:) let users set alert thresholds, choose data sources, and control what informs guidance (Figure 5k).

5 DISCUSSION

While this work translated perimenopausal challenges and needs into concrete, actionable design recommendations, two issues merit deeper discussion: (i) how to balance a life-course, diversity-aware approach with simple, low-effort use, and (ii) why destigmatization ultimately requires action beyond design considerations for MHTs.

5.1 A Lifelong Companion Balancing Continuity and Diversity

This research makes a case for rethinking MHTs as continuous, adaptive companions rather than siloed tools tied to discrete life stages. Instead of pushing users from fertility-focused apps to separate perimenopause tools, creating breaks in data and experience (Section 2.2), we advocate for a life course approach that retains historical data, reduces friction, and supports early awareness so bodily literacy can

build over time (Grimme et al., 2024; Lopez Burst et al., 2024). Continuity, however, only works if it accommodates diversity. Perimenopause shows why one-size-fits-all designs fail: cycles become irregular, symptom constellations differ, and needs shift dynamically. A core design tension is therefore how to cover diverse experiences across the life course while keeping interfaces simple and low effort. We argue for simplicity through diversity: lightweight customisation that lets users focus the app on their priorities, agency over what to track and surface and when to be prompted, and progressive disclosure so depth appears only on demand. Because no single app can meet all needs indefinitely, systems also need interoperability and data portability (e.g., data export/import) so users can explore specialised tools without losing history (Epstein et al., 2015).

Even with these steps, designing for diversity at scale is challenging: no fixed symptom list or tone fits everyone, and language must adapt to regional and individual preferences. Future work should therefore examine how a life-course companion can concretely support the transition from pre- into perimenopause, including longitudinal, in-the-wild deployments of such prototypes to better capture lived experience and iteratively refine data and governance practices. The goal is longitudinal anticipation that keeps users in control of what is collected, how it is used, and with whom it is shared. In short, a lifelong companion is only viable when continuity is paired with genuine diversity, through customisation, user agency, modular features, and portability, so one application can support many realities without adding extra work.

5.2 MHT as Catalyst, Not Cure

Perimenopause remains underrepresented in research and mainstream digital discourse, reinforcing stigma and leaving many feeling unprepared (World Economic Forum, 2024; Nature, 2025). Feminist HCI calls for designs that embrace diversity, reflect embodied realities, and resist universalised user models (Bardzell, 2010; Almeida et al., 2020; Nißen et al., 2024) Our results echo this: inclusive tone, visible diversity, and flexible terminology can help reduce shame and make experiences more discussable.

Yet stigma is social and structural. No single app can counter workplace norms, clinical gatekeeping, or policy and media narratives. Progress requires multilevel action: product-level choices (peer communities, positive framing, clinician integration), clinical partnerships (co-developed guidance, summary reports), institutional supports (HR policies, educator training, inclusive communication), and broader public education that reframes perimenopause as a normal life stage rather than a deficit (Dahlgren et al., 2023; Chopra et al., 2024; Namazi et al., 2019).

MHTs should therefore be seen as catalysts, not cures: tools that make experiences visible, help users articulate needs, and connect them to wider ecosystems of support. Future work should examine how specific features interact with these wider forces and whether they can amplify normalisation over time (Bardzell, 2010).

5.3 Limitations

This study has several limitations. First, our online convenience sample of midlife participants (45–55) from the UK and DACH regions may under-represent earlier or later transitions, gender-diverse users, people with limited digital access, and those from other cultural or socioeconomic contexts; generalisability is therefore limited. Second, the cross-sectional, self-report survey design introduces recall and social-desirability bias and does not capture how needs evolve over time. Third, thematic coding and the development of the 11 feature categories were led by one researcher, with a second researcher reviewing the resulting codebook/categories and themes for coherence and plausibility. While this review strengthened credibility, we did not employ independent parallel coding or formal agreement metrics, which may limit interpretive robustness. Fourth, our focused review of existing MHTs and literature was intended to inform design directions rather than provide an exhaustive or systematic evaluation of effectiveness; given the rapid evolution of app ecosystems, features and policies may have changed. Finally, we did not conduct a longitudinal evaluation of the proposed design considerations. A multi-week deployment will be needed to assess whether users recognise and benefit from these considerations in everyday use.

6 CONCLUSION

This paper foregrounded lived experiences of perimenopause to derive design needs (e.g., understanding one's body, preparing for upcoming changes, and managing day-to-day life with low effort) and synthesised them into design considerations, such as destigmatising perimenopause and embracing heterogeneity in MHTs. These directions aim to move MHTs beyond isolated cycle trackers toward continuous, trustworthy companions that support a more holistic approach and help scale up women's health across life stages.

ACKNOWLEDGEMENTS

We thank Stefanie Krohmann for her master's thesis work and contributions, and all participants and colleagues for their time and feedback.

Use of AI. An AI assistant (GPT-5.2) was used for language editing and formatting suggestions; all AI-assisted text was reviewed and approved by the authors.

CONFLICT OF INTEREST

MP, SK, TK, and MN are affiliated with the Centre for Digital Health Interventions (CDHI), which oversees publicly and industry-funded projects. MP received financial support from the Digital Society Initiative (DSI) at the University of Zurich. This study was not supported by industry funding, and no industry partners were involved in the study design, data collection, analysis, interpretation, or writing.

REFERENCES

Almeida, T., Balaam, M., and Comber, R. (2020). Woman-centered design through humanity, activism, and inclusion. *ACM Transactions on Computer-Human Interaction*, 27(4):1–30.

Andrews, R., Hale, G., John, B., and Lancastle, D. (2021). Evaluating the effects of symptom monitoring on menopausal health outcomes: A systematic review and meta-analysis. *Frontiers in Global Women's Health*, 2:757706.

Andrews, R., Lancastle, D., Bache, K., and Lacey, A. S. (2023a). Does Health & Her app use improve menopausal symptoms? A longitudinal cohort study. *BMJ*, 13(12):e077185.

Andrews, R. A. F., John, B., and Lancastle, D. (2023b). Symptom monitoring improves physical and emotional outcomes during menopause: a randomized controlled trial. *Menopause*, 30(3):267–274.

Atkins, A. (2023). Menopause apps you should know about. https://www.everydayhealth.com/menopause/menopause-apps-you-should-know-about/. Everyday Health. Accessed: 2025-10-28.

Backonja, U., Taylor-Swanson, L., Miller, A. D., Jung, S. H., Haldar, S., and Woods, N. F. (2021). "There's a problem, now what's the solution?": Suggestions for technologies to support the menopausal transition from individuals experiencing menopause and healthcare practitioners. *Journal of the American Medical Informatics Association*, 28(2):209–221.

Bardzell, J., Bardzell, S., Lazar, A., and Su, N. M. (2019). (re-)framing menopause experiences for hci and design. In Brewster, S., Fitzpatrick, G., Cox, A., and Kostakos, V., editors, *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, pages 1–13, New York, NY, USA. ACM.

Bardzell, S. (2010). Feminist HCI: taking stock and outlining an agenda for design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '10, page 1301–1310, New York, NY, USA. Association for Computing Machinery.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2):77–101.

British Menopause Society (2023). What is the menopause? (factsheet). https://thebms.org.uk/wp-content/uploads/2023/08/17-BMS-TfC-What-is-the-menopause-AUGUST2023-A.pdf. Accessed: 2025-10-28.

Broad, A., Biswakarma, R., and Harper, J. C. (2022). A survey of women's experiences of using period tracker applications: Attitudes, ovulation prediction and how the accuracy of the app in predicting period start dates affects their feelings and behaviours. *Women's health*, 18:17455057221095246.

Case, A. (2015). *Calm Technology: Principles and Patterns for Non-Intrusive Design*. O'Reilly Media, Inc., Sebastopol, CA, USA, first edition edition. First edition (Dec. 2015). Copyright 2016.

Chadha, N., Chadha, V., Ross, S., and Sydora, B. C. (2016). Experience of menopause in aboriginal women: a systematic review. *Climacteric : the journal of the International Menopause Society*, 19(1):17–26.

Choe, E. K., Lee, N. B., Lee, B., Pratt, W., and Kientz, J. A. (2014). Understanding quantified-selfers' practices in collecting and exploring personal data. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '14, page 1143–1152, New York, NY, USA. Association for Computing Machinery.

Chopra, S., Orii, L., Juarez, K., Tieanklin, N., Fogarty, J., and Munson, S. A. (2024). Menopause legacies: Designing to record and share experiences of menopause across generations. *Proceedings of the ACM on human-computer interaction*, 8(CSCW2)(CSCW2):1–37.

Chowdhury, H. and Sultana, S. (2025). From literature to ReWA: Discussing reproductive well-being in HCI. arXiv.

Cowell, A. C., Gilmour, A., and Atkinson, D. (2024). Support mechanisms for women during menopause: Perspectives from social and professional structures. *Women*, 4(1):53–72.

Dahlgren, M. K., Kosereisoglu, D., Smith, R. T., Sagar, K. A., Lambros, A. M., El-Abboud, C., and Gruber, S. A. (2023). Identifying variables associated with menopause-related shame and stigma: Results from a national survey study. *Journal of women's health*, 32(11):1182–1191.

Epstein, D. A., Lee, N. B., Kang, J. H., Agapie, E., Schroeder, J., Pina, L. R., Fogarty, J., Kientz, J. A., and Munson, S. A. (2017). Examining menstrual tracking to inform the design of personal informatics tools. *Proceedings of the SIGCHI Conference on Hu-*

man Factors in Computing Systems. CHI Conference, 2017:6876–6888.

Epstein, D. A., Ping, A., Fogarty, J., and Munson, S. A. (2015). A lived informatics model of personal informatics. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing*, UbiComp '15, page 731–742.

Flo Health Inc. (2025). Flo period & pregnancy tracker. https : / / play.google.com / store / apps / details?id = org.iggymedia.periodtracker&hl=en. Google Play Store. Accessed: 2025-02-04.

Fox, S. and Epstein, D. A. (2020). Monitoring menses: Design-based investigations of menstrual tracking applications. In Bobel, C., Winkler, I. T., Fahs, B., Hasson, K. A., Kissling, E. A., and Roberts, T.-A., editors, *The Palgrave Handbook of Critical Menstruation Studies*, pages 733–750. Springer Singapore, Singapore.

Grieger, J. A. and Norman, R. J. (2020). Menstrual cycle length and patterns in a global cohort of women using a mobile phone app: Retrospective cohort study. *Journal of medical Internet research*, 22(6):e17109.

Grimme, S., Spoerl, S. M., Boll, S., and Koelle, M. (2024). My data, my choice, my insights: Women's requirements when collecting, interpreting and sharing their personal health data. In Mueller, F. F., Kyburz, P., Williamson, J. R., Sas, C., Wilson, M. L., Dugas, P. T., and Shklovski, I., editors, *Proceedings of the CHI Conference on Human Factors in Computing Systems*, pages 1–18, New York, NY, USA. ACM.

Hardy, C., Griffiths, A., Thorne, E., and Hunter, M. (2019). Tackling the taboo: talking menopause-related problems at work. *International Journal of Workplace Health Management*, 12(1):28–38.

Harlow, S. D., Gass, M., Hall, J. E., Lobo, R., Maki, P., Rebar, R. W., Sherman, S., Sluss, P. M., and de Villiers, T. J. (2012). Executive summary of the stages of reproductive aging workshop + 10: addressing the unfinished agenda of staging reproductive aging. *The Journal of Clinical Endocrinology and Metabolism*, 97(4):1159–1168.

Hickey, M., Riach, K., Kachouie, R., and Jack, G. (2017). No sweat: managing menopausal symptoms at work. *Journal of Psychosomatic Obstetrics and Gynaecology*, 38(3):202–209.

Hoga, L., Rodolpho, J., Gonçalves, B., and Quirino, B. (2015). Women's experience of menopause: a systematic review of qualitative evidence. *JBI database of systematic reviews and implementation reports*, 13(8):250–337.

Homewood, S. (2018). Designing for the changing body. In Mandryk, R., Hancock, M., Perry, M., and Cox, A., editors, *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, pages 1–4, New York, NY, USA. ACM.

Keyes, O., Peil, B., Williams, R. M., and Spiel, K. (2020). Reimagining (women's) health. *ACM Transactions on Computer-Human Interaction*, 27(4):1–42.

Kim, N. Y., Da Kim, S., Han, D. H., Hong, J. S., Shim, Y., Yoon, Y. J., Kim, H. J., and Kim, S. M. (2024). Validation of the efficacy of a personalized information-provision and exercise-coaching app on the quality of life of menopausal women. *Maturitas*, 189:108113.

Krug, S. (2000). *Don't Make Me Think: A Common Sense Approach to Web Usability*. New Riders.

Lassi, Z. S., Wade, J. M., and Ameyaw, E. K. (2025). Stages and future of women's health: A call for a life-course approach. *Women's Health*, 21:17455057251331721.

Lazar, A., Su, N. M., Bardzell, J., and Bardzell, S. (2019). Parting the red sea. In Brewster, S., Fitzpatrick, G., Cox, A., and Kostakos, V., editors, *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, pages 1–16, New York, NY, USA. ACM.

Levy, J. and Romo-Avilés, N. (2019). "a good little tool to get to know yourself a bit better": a qualitative study on users' experiences of app-supported menstrual tracking in europe. *BMC Public Health*, 19(1):1213.

Li, I., Dey, A. K., and Forlizzi, J. (2011). Understanding my data, myself: supporting self-reflection with ubicomp technologies. In *Proceedings of the 13th International Conference on Ubiquitous Computing*, UbiComp '11, page 405–414, New York, NY, USA. Association for Computing Machinery.

Lopez Burst, E., Ciolfi Felice, M., and O'Kane, A. A. (2024). Using and appropriating technology to support the menopause journey in the uk. In Mueller, F. F., Kyburz, P., Williamson, J. R., Sas, C., Wilson, M. L., Dugas, P. T., and Shklovski, I., editors, *Proceedings of the CHI Conference on Human Factors in Computing Systems*, pages 1–14, New York, NY, USA. ACM.

Mahady, G., Locklear, T., Doyle, B., Huang, Y., Perez, A., and Caceres, A. (2008). Menopause, a universal female experience: Lessons from mexico and central america. *Current Women's Health Reviews*, 4(1):3–8.

Marnocha, S. K., Bergstrom, M., and Dempsey, L. F. (2011). The lived experience of perimenopause and menopause. *Contemporary Nurse*, 37(2):229–240.

Mayo Clinic (2024). Menopause — symptoms and causes. Perimenopause can last 2–8 years; average about 4 years.

McChlery, S. M. (2021). *Women's experiences of perimenopause*. PhD thesis, Murdoch University.

McElhany, K. (2025). *Anxiety during Perimenopause: A Narrative Qualitative Study of the Women's Lived Experiences*. Doctoral dissertation, The University of Texas Health Science Center at Houston, Cizik School of Nursing. Dissertations & Theses (Open Access), Paper 72.

McGee, A. (2023). Introducing clue perimenopause: A new mode designed to help you navigate the transition to menopause.

McKinsey & Company (2022). Unlocking opportunities in women's healthcare. *McKinsey & Company*.

Mylonopoulou, V. (2018). Design for health behavior change supportive technology: healthcare professionals' perspective. In *Proceedings of the 10th Nordic Conference on Human-Computer Interaction*, NordiCHI '18, page 82–92, New York, NY, USA. Association for Computing Machinery.

Namazi, M., Sadeghi, R., and Behboodi Moghadam, Z. (2019). Social determinants of health in menopause: An integrative review. *International Journal of Women's Health*, 11:637–647.

National Institute of Standards and Technology (2024). Human factors and human-centered design. https://www.nist.gov/itl/iad/visualization-and-usability-group/human-factors-human-centered-design. U.S. Department of Commerce. Accessed: 2026-01-19.

National Institute on Aging (2024). What is menopause? https://www.nia.nih.gov/health/menopause/what-menopause. Accessed: 2026-01-19.

Nature (2025). Menopause research is globally underfunded. it's time to change that. *Nature*, 637(8047):763.

Nature Medicine (2024). A life-course approach to women's health. *Nature Medicine*, 30(1):1. Editorial.

Nielsen, J. (1994). 10 usability heuristics for user interface design. https://www.nngroup.com/articles/ten-usability-heuristics/. Accessed: 2026-01-19.

Nißen, M., Sou, D., and Kowatsch, T. (2024). Digital female health: Advancing women-centric human-computer interaction research. In *Workshopband MuC 2024*.

Ogle, A. (2024). The 10 best menopause apps for tracking & managing symptoms. https://www.theflowspace.com/reproductive-health/menopause/best-menopause-apps-2941944/. Accessed: 2026-1-19.

O'Reilly, K., McDermid, F., McInnes, S., and Peters, K. (2024). "I was just a shell": Mental health concerns for women in perimenopause and menopause. *International Journal of Mental Health Nursing*, 33(3):693–702.

Paripoorani, D., Gasteiger, N., Hawley-Hague, H., et al. (2023). A systematic review of menopause apps with an emphasis on osteoporosis. *BMC Women's Health*, 23.

Patel, U., Broad, A., Biswakarma, R., and Harper, J. C. (2024). Experiences of users of period tracking apps: which app, frequency of use, data input and output and attitudes. *Reproductive biomedicine online*, 48(3):103599.

Pichon, A., Jackman, K. B., Winkler, I. T., Bobel, C., and Elhadad, N. (2022). The messiness of the menstruator: assessing personas and functionalities of menstrual tracking apps. *Journal of the American Medical Informatics Association*, 29(2):385–399.

Prolific (2025). Prolific's payment principles. https://researcher-help.prolific.com/en/articles/445230-prolific-s-payment-principles. Accessed: 2025-06-01.

Pyne, Y., Burgin, J., and Hickey, M. (2024). Towards a more accurate global picture of perimenopause. *Bulletin of the World Health Organization*, 102(12):922–924.

Riley, S. and Paskova, K. (2022). A post-phenomenological analysis of using menstruation tracking apps for the management of premenstrual syndrome. *Digital health*, 8:20552076221144199.

Santoro, N. (2016). Perimenopause: From research to practice. *Journal of women's health (2002)*, 25(4):332–339.

Santoro, N. and Randolph, J. F. (2011). Reproductive hormones and the menopause transition. *Obstetrics and gynecology clinics of North America*, 38(3):455–466.

Schantz, J. S., Fernandez, C. S. P., and Anne Marie, Z. J. (2021). Menstrual cycle tracking applications and the potential for epidemiological research: A comprehensive review of the literature. *Current epidemiology reports*, 8(1):9–19.

Sillence, E., Hardy, C., and Kemp, E. (2023). "This app just gets me": Assessing the quality, features and user reviews of menopause smartphone apps. *Journal of Consumer Health on the Internet*, 27(2):156–172.

Statista (2025). Leading period tracker and female health apps worldwide in june 2025, by downloads. https://www.statista.com/statistics/1307702/top-period-tracker-apps-worldwide-by-downloads/. Accessed: 2025-11-17.

Tutia, A., Baljon, K., Vu, L., and Rosner, D. K. (05022019). Hci and menopause. In Brewster, S., Fitzpatrick, G., Cox, A., and Kostakos, V., editors, *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*, pages 1–8, New York, NY, USA. ACM.

van Manen, M. (1997). *Researching Lived Experience: Human Science for an Action Sensitive Pedagogy*. Routledge, 2 edition.

World Economic Forum (2024). Closing the women's health gap: A $1 trillion opportunity to improve lives and economies. https://www.weforum.org/publications/closing-the-women-s-health-gap-a-1-trillion-opportunity-to-improve-lives-and-economies/. Accessed: 2026-01-19.

World Economic Forum and McKinsey Health Institute (2025). Blueprint to close the women's health gap: How to improve lives and economies for all. https://www.weforum.org/publications/blueprint-to-close-the-women-s-health-gap-how-to-improve-lives-and-economies-for-all/. Accessed: 2026-01-19.

World Health Organization (2024). Menopause. https://www.who.int/news-room/fact-sheets/detail/menopause. Fact sheet. Accessed: 2024-12-17.