Original Paper

Technology Acceptance and Usability of the GuardIO mHealth App Among Persons Living With Dementia or Mild Cognitive Impairment and Their Care Partners: Multimethods Study

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Abstract

Background: Mobile health (mHealth) apps offer a promising approach to support the safety and community mobility of persons living with dementia or mild cognitive impairment (MCI). However, many digital health technologies fail to achieve sustained adoption because acceptance and usability challenges emerge during real-world use.

Objective: This pilot study evaluated the technology acceptance and usability of the GuardIO mobile app, a smartphone-based location-monitoring system for persons living with dementia or MCI and their care partners.

Methods: We conducted a multimethod pilot usability evaluation with 12 persons living with dementia or MCI and their 12 care partners (N=24), who used the GuardIO app in their everyday activities for 1 month. The V3+ framework for usability validation of digital health technologies guided the study. We collected quantitative data using questionnaires based on the unified theory of acceptance and use of technology before and after app use. We obtained qualitative data through semistructured interviews and analyzed them using conventional content analysis.

Results: Overall acceptance and usability scores were high among both persons living with dementia or MCI and their care partners. In exploratory analyses, performance expectancy correlated significantly with behavioral intention among persons living with dementia or MCI (r_s=0.576; P=.04) and care partners (r_s=0.865; P<.001). Actual use correlated significantly with behavioral intention in both persons living with dementia or MCI (r_s=0.711; P=.009) and care partners (r_s=0.733; P=.007). Qualitative findings indicated that the app's primary value was providing care partners with peace of mind through real-time location monitoring while supporting independent community participation among persons living with dementia or MCI. However, user-related issues, system design factors, and usability challenges hindered sustained use, including battery drain, location inaccuracies, and concerns about data transparency and privacy. Participants also reported that the app was most suitable during the early stages of cognitive decline when independent smartphone use remained feasible.

Conclusions: GuardIO demonstrated strong perceived usefulness, but usability, reliability, and data privacy barriers constrained sustained use. Taken together, these findings suggest that persons living with dementia or MCI and their care partners were willing to use the app when they could, particularly if developers resolved usability issues.

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(JMIR Hum Factors 2026;13:e107718) doi: 10.2196/107718

KEYWORDS

geolocation; location monitoring; missing person; community mobility; assistive technology; remote monitoring; dementia; cognitive impairment; technology acceptance; usability

Introduction

The global population is undergoing a demographic shift, with adults aged 60 years and older accounting for approximately 12% of the global population in 2020, a proportion projected to increase to 22% by 2050 [1]. Structural, neurophysiological, and neurochemical changes in the aging brain are associated with cognitive impairment [2-4]. Mild cognitive impairment (MCI) represents an intermediate phase between normal cognitive aging and dementia, characterized by noticeable cognitive changes in memory, spatial orientation, and wayfinding [5,6]. Progressive dementia, a more severe form of cognitive decline, affects over 57 million people worldwide and is expected to triple to 153 million by 2050 [7].

Persons living with dementia may experience spatial disorientation and become lost, which can result in serious safety risks, including injury or death [8,9]. Although individuals with MCI generally retain functional independence and may be able to problem-solve or reorient themselves, some may experience early spatial navigation or wayfinding difficulties, particularly when cognitive changes affect memory, attention, or orientation [10]. Care partners also experience an increased burden, which may contribute to the development of mental health issues such as depression [11]. Accordingly, location-monitoring technologies may be most directly relevant for individuals living with dementia who are at risk of becoming lost, while also offering potential preventive or supportive value for some individuals with MCI and their care partners. In this context, such technologies may support safety, reassurance for care partners, and continued community participation, provided they are acceptable and usable for both members of the care dyad [12,13].

Successful adoption of these technologies by persons living with dementia or MCI and their care partners requires both user acceptance and usability. User acceptance refers to a system of beliefs and attitudes that supports willingness to use a technology, such as perceiving it as useful or responsive to users' needs, whereas usability concerns effectiveness, efficiency, and satisfaction within a specified context of use [14,15]. Users abandon many technologies because acceptance and usability issues arise before they can realize the technologies' potential benefits. For instance, one study found that 50% of US consumers who owned wearable devices, including wristbands, smartwatches, and biomonitors, had discontinued using them [16]. The study identified 2 key reasons for this discontinuation: the devices failed to add functional value beyond what users already expected from personal technology and they required too much effort to use, disrupting the seamless experience needed for sustained use [16].

The risk of technology abandonment due to acceptance and usability barriers is particularly consequential for persons living with dementia or MCI, for whom the window for early technology adoption may narrow as their cognitive condition progresses [14]. If users perceive a technology as difficult to use, burdensome, or poorly suited to the needs of either the individual or the care partner, they may reject or discontinue it before it delivers any meaningful benefit [17]. Sustained use, therefore, depends on both the individual and their care partner perceiving the technology as practical, suitable, and useful in the context of their condition [14,17].

High abandonment rates have implications not only for end users and health care systems but also for the small- and medium-sized enterprises (SMEs) that develop these technologies [18]. When a technology is abandoned after early implementation, SMEs may be unable to successfully commercialize the product, limiting their ability to recover invested time, effort, and financial capital [18]. This can result in substantial resource losses and may further intensify the "valley of death" phenomenon, in which promising innovations fail to progress from development to sustainable market adoption [19,20].

A growing body of research has examined the acceptance and usability of tracking technologies among persons living with dementia or MCI; however, this literature has largely focused on hardware-based solutions, particularly wearable GPS devices [21-24]. A review of GPS-derived mobility indicators across 24 studies confirmed this imbalance: 12 (50%) studies used wearable GPS devices and included 2411 participants, whereas only 2 (8%) used smartphone-based mobile apps and included 83 participants [25]. This narrow focus on wearable GPS devices is concerning because these devices face well-documented barriers to sustained use, including high cost, limited reliability, and aesthetic designs that may not be suitable for everyday wear [13,22,26]. Stigma associated with visible monitoring devices, such as wearable GPS trackers, has been identified as a further barrier to acceptance among persons living with dementia and their care partners [27,28]. Even in controlled research settings, adoption has proven difficult; for example, one study reported that care partners found GPS trackers unsuitable for daily use due to device malfunctions, usability issues, and bulky, unattractive designs [29]. Similarly, another study found that users were concerned about false GPS alarms and inaccurate notifications (eg, indicating that a person with dementia was lost when the individual was not) and excessive battery consumption [13]. Consistent with these findings, other studies have highlighted similar issues; in one study examining the acceptance of GPS technology among care partners and persons living with dementia, 9 of 10 care partners reported that battery life was too short [30]. Taken together, these findings suggest that while the need for location-tracking technology is well established, the device used may itself be an obstacle to acceptance and usability.

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Smartphones represent one potential alternative to wearable GPS devices, and their adoption among older adults is rising rapidly. Smartphone ownership among older adults has risen substantially worldwide, with countries such as Canada reporting 60% ownership [31]. Mobile health (mHealth) apps have already demonstrated utility in dementia care, including cognitive training, medication reminders, daily activity scheduling, and care partner communication and support [32-36]. For location tracking, apps offer practical advantages over dedicated wearables: they leverage hardware that users already own and carry, avoid the stigma of a visible tracking device, and integrate multiple functions into a single familiar platform [37]. Despite these advantages, a review of mobile apps for caregivers of older adults identified 22 apps specifically designed for caregivers of persons living with dementia, including 2 smartphone apps that used GPS to provide caregivers with the location of persons living with dementia [33]. However, the review examined available app features rather than their acceptance and usability. Evidence therefore remains limited on the acceptance and usability of smartphone-based GPS location-monitoring apps during sustained community use by persons living with dementia or MCI and their care partners.

Therefore, this pilot study investigated the technology acceptance and usability of the GuardIO family care mobile app for location monitoring among persons living with dementia or MCI and their care partners and identified barriers and facilitators influencing its adoption and sustained use in community settings. We also intended this evaluation to inform iterative refinement of the app by identifying usability issues and implementation challenges that could affect learnability, efficiency, user satisfaction, and long-term engagement.

Methods

Study Design

This pilot study used a multimethod design [38]. This design was appropriate, given the study's acceptance- and usability-focused objectives; we did not intend to measure clinical effectiveness but rather to explore technology acceptance and user experience among persons living with dementia or MCI and their care partners. We used a multimethod approach that integrated (1) quantitative pre- and posttest questionnaires and (2) individual qualitative interviews with a subsample of participants.

Theoretical Framework

This pilot study was guided by the V3+ framework for evaluating sensor-based digital health technologies [39]. The V3+ framework extends the original V3 model by adding usability validation alongside verification, analytical, and clinical validation. V3+ defines usability validation as the evaluation of the extent to which a sensor-based digital health technology can be used to achieve specified goals with ease, efficiency, and user satisfaction within its intended context of use. The framework emphasizes the importance of clearly specifying intended user groups, use environments, and user interactions. Within V3+, the framework positions usability validation after verification and before analytical and clinical validation because researchers must first show that the technology functions as intended while assessing usability early enough to prevent use-related errors, missing data, and other threats to downstream validation. The V3+ framework organizes usability validation into 4 key activities: developing a use specification, implementing a use-related risk analysis, conducting formative evaluation of prototype products, and conducting summative evaluation of final products against predefined usability criteria. In the present study, we conducted a pilot usability evaluation of the GuardIO app with a small sample of persons living with dementia or MCI and their care partners in its intended context of use.

To operationalize the usability validation component of V3+, we adopted the UTAUT (unified theory of acceptance and use of technology) [40]. UTAUT provides a framework for analyzing individuals' intentions to adopt technology and their use behavior [40]. The theory identifies performance expectancy, effort expectancy, and social influence as key factors that influence the intention to use a technology, while facilitating conditions and behavioral intention directly determine use behavior. We selected UTAUT because researchers have applied it to health information technologies used by older adults, including mHealth apps [41,42].

While V3+ does not privilege UTAUT over other models, it acknowledges that models such as UTAUT are informative for evaluating technology acceptance and usability-related concepts, and it encourages the development of usability approaches tailored to the specific challenges of sensor-based digital health technologies. In this respect, the usability validation component of V3+ aligns with the broader usability tradition reflected in the work of Nielsen [43], which conceptualizes usability within the larger construct of system acceptability and usefulness and emphasizes attributes such as learnability, efficiency, memorability, user errors, and satisfaction. UTAUT and Nielsen's usability perspective are complementary rather than competing; UTAUT explains whether users perceive a technology as useful, easy to use, and adequately supported, and whether they actually use it, while Nielsen's perspective evaluates how the technology functions in practice. Within the V3+ framework, these 2 perspectives together provide a coherent rationale for examining both technology acceptance and usability in evaluating the GuardIO app.

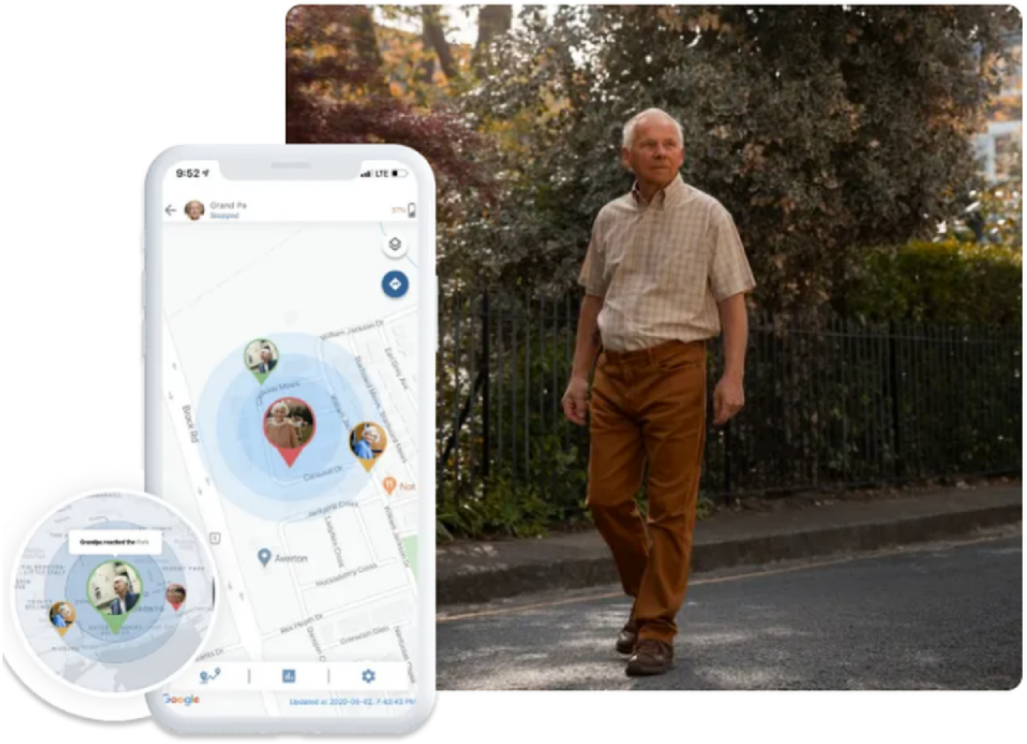
The Technology: GuardIO Family Care App

The GuardIO family care app (hereafter, the GuardIO app) was developed by WeTraq, a Canadian-based company (Figure 1) [44]. The GuardIO app is a Health Canada–licensed mobile app designed to support care partners by tracking the location and mobility of at-risk individuals, such as persons living with dementia or MCI. The GuardIO app creates a secure, private care network for families, enabling real-time safety alerts, mobility tracking during walking or driving, and caregiving coordination. Key features include location sharing, safe-zone alerts, driver-behavior reports, trip history, and emergency check-ins. Persons living with dementia or MCI and care partners use the app on their own smartphones, allowing the app to track the location and driving behavior of both users. Care partners use the private care network to view shared locations and receive alerts. Driver-behavior reports provide

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feedback on driving events, including speeding incidents. TELUS securely stores the data on its cloud infrastructure in compliance with Canadian health care regulations, and users retain control over their data. While the GuardIO app provides a relatively unobtrusive and practical approach to monitoring mobility behaviors, no study has evaluated its acceptance and usability among individuals with cognitive impairment and their care partners. As GuardIO incorporates sensor-derived location and motion data to support monitoring in a real-world care context, the V3+ framework can meaningfully inform its evaluation, particularly through its emphasis on technology acceptance and usability validation.

Figure 1. The GuardIO family care app. Reproduced from WeTraq website [44], with permission from WeTraq Inc.



Setting

We conducted the study in community settings rather than in a clinic or laboratory, and participants used the GuardIO app during their daily activities in the community (eg, walking, driving, and running errands).

Sample Size Calculation

For the quantitative component, we defined technology acceptance and usability problems as those affecting 10% or more of users, with an 85% probability of detection if they exist. Based on this criterion, the calculation required a minimum of 18 participants: log (1–0.85)/log (1–0.10)=18.006 [45]. Given the pilot nature of this study, recruitment targeted this minimum threshold. We conducted semistructured interviews with a subsample of the quantitative cohort to gain deeper insight into users' experiences and perceptions of the GuardIO app [46].

Participants

Given the exploratory nature of this study and the known challenges of recruiting persons living with dementia or MCI and their care partners, we considered a convenience sample feasible. We recruited participants as persons living with dementia or MCI-care partner dyads through Alzheimer Society chapters across Canada and Saudi Arabia. The research team contacted these chapters and arranged presentations to early-stage dementia support groups, during which team members introduced the study and answered questions. The team also posted the study on the Alzheimer Society's research portal and invited prospective participants to contact the research team directly with questions or to express interest in enrolling. In total, we enrolled 24 participants (12 dyads).

Inclusion Criteria

Persons living with dementia or MCI were eligible if they had a diagnosis of MCI or dementia, were able to provide informed consent, owned a smartphone capable of downloading and running the GuardIO app, and spoke English. Care partners were eligible if they were aged 18 years or older, identified as the primary care partner, owned a smartphone capable of downloading and running the GuardIO app, and spoke English.

Ethical Considerations

The following institutions approved the study: the University of Alberta (Pro00131857), the University of Waterloo (REB 45162), and King Saud bin Abdulaziz University for Health Sciences (NRA25/014/5). Given the inclusion of persons living with dementia or MCI, the research team implemented additional procedures to support valid informed consent. The team used a teach-back approach to assess participants' understanding of key study information, and all participants provided written informed consent before enrollment. The research team deidentified all participant data before analysis and handled them in accordance with institutional privacy and confidentiality

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requirements. The study dataset used for analysis contained no personally identifiable information.

Variables

Participant demographics collected included age, sex, diagnosis, comfort level using digital technology, country of residence, and number of years as a care partner. Consistent with the UTAUT, the constructs measured in this study included performance expectancy, effort expectancy, social influence, facilitating conditions, behavioral intention to use, and actual use of the GuardIO app [40].

Instruments

We administered technology acceptance and usability questionnaires using items that have previously demonstrated high internal consistency within the UTAUT framework [13,40]. A pretest questionnaire established a baseline for GuardIO app acceptance, while the posttest questionnaire assessed actual use behavior and whether participants' expectations were met (see Multimedia Appendix 1 for more detail).

Both questionnaires contained 2 sections: Section A gathered demographic information and Section B assessed the UTAUT constructs. We used 2 versions of the questionnaire, each with a different response scale (ie, one for persons living with dementia or MCI and another for care partners). Persons living with dementia or MCI responded on a 3-point Likert scale ranging from 0=disagree to 2=agree. In contrast, care partners responded on a 5-point Likert scale ranging from 0=strongly disagree to 4=strongly agree. We adopted the simplified 3-point scale for persons living with dementia or MCI to reduce the cognitive burden of completing the questionnaire, given that they may have difficulty processing complex response formats. This approach is consistent with the survey methodology literature, which supports using fewer response categories when respondents have limited cognitive capacity, as simplified scales reduce measurement error without substantially compromising reliability [47]. Prior research on acceptance of locator devices and GPS technologies has used similar adaptations involving individuals with cognitive impairment [48].

The pretest questionnaire included 19 items evaluating the following UTAUT constructs: performance expectancy (4 items), effort expectancy (4 items), social influence (4 items), facilitating conditions (4 items), and behavioral intention (3 items). We expanded the posttest questionnaire to 22 items, covering the same constructs and adding 3 items to measure actual use of the GuardIO app. For constructs measured with 4 items, the maximum score is 8 for persons living with dementia or MCI and 16 for care partners; for constructs measured with 3 items, the maximum is 6 for persons living with dementia or MCI and 12 for care partners. Summing across all UTAUT constructs, the maximum possible summative scale score on the pretest questionnaire was 38 for persons living with dementia or MCI, and on the posttest, the score was 44. The corresponding maximum summative scale scores for care partners on their original 5-point scale were 76 (pretest) and 88 (posttest).

Higher scores indicate greater performance expectancy (usefulness), effort expectancy (ease of use), social influence (the extent to which a person feels that people important to them think they should use a particular technology), facilitating conditions (availability of resources and support for use), behavioral intention (technology acceptance), and actual use (technology use). We assessed memorability, usefulness, and use errors during actual use of the GuardIO app through weekly telephone check-ins and semistructured interviews. Weekly check-ins served as a brief, structured log of actual use, consistent with Nielsen's usability framework [43], in which the primary researcher (SA) documented participants' experiences and helped resolve any issues raised during the call. After 1 month of GuardIO use, we conducted semistructured interviews guided by 5 open-ended questions to explore the dyad experiences in greater depth. Questions focused on participants' experiences with the GuardIO app, including perceived usefulness, influence to use it, and difficulties encountered during use (see Multimedia Appendix 1 for more detail).

Procedures

Interested individuals contacted the primary researcher (SA), who then invited them to a screening and information session. During this session, the primary researcher confirmed eligibility against the inclusion criteria and informed eligible individuals about the study's purpose, procedures, timeline, and voluntary nature of participation. Persons living with dementia or MCI underwent a teach-back approach to obtain informed consent, as used in previous similar studies [49], to assess their ability to understand and articulate key aspects of the study, including its purpose, risks, and withdrawal procedures [50,51]. All participants provided written informed consent before enrollment (see Multimedia Appendix 2 for more detail).

Following enrollment, participants completed the pretest questionnaire prior to using the GuardIO app. Each dyad participated in an online session in which the primary researcher demonstrated how to download, install, and use the GuardIO app on their smartphones. Participants then used the GuardIO app for 1 month, during which the primary researcher conducted weekly check-in calls lasting up to 5 minutes to address technical issues, answer questions, and monitor usability. At the end of the month, participants completed the posttest questionnaire. Participants received CAD $25 for completing each questionnaire, for a total honorarium of CAD $50 (CAD $1=US $0.70 as of November 13, 2026). We carried out all study procedures remotely via online platforms.

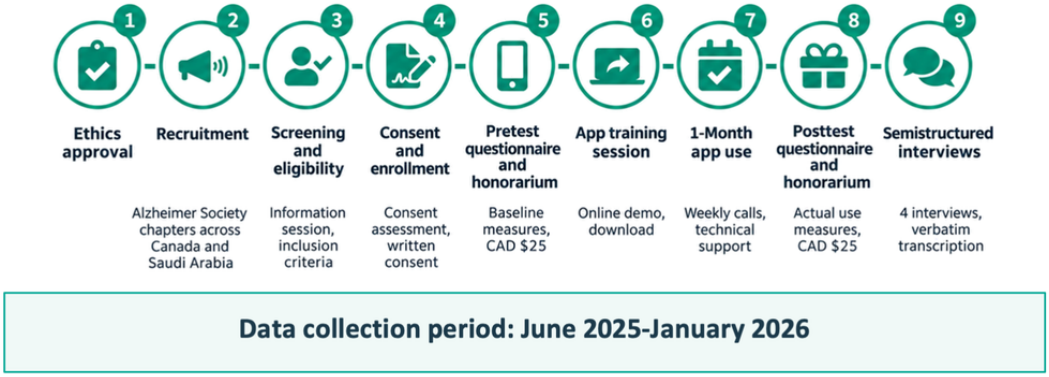
Following 1 month of GuardIO app use, we invited all 24 participants to participate in optional, individual semistructured interviews. Three members of the research team conducted interviews virtually via Google Meet: SA (PhD student) and CD and AMC (professors), all of whom had previous experience conducting qualitative research. Those willing to participate contacted SA to schedule an interview. Reported reasons for nonparticipation included lack of interest and travel.

The interviews followed a guide comprising 5 open-ended questions, each accompanied by up to 3 probing questions. Each interview lasted between 36 and 48 minutes, and we conducted no repeat interviews. The research team audio-recorded and transcribed the interviews verbatim. Interviewers took field notes immediately after each interview. We did not return

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transcripts to participants for review or ask participants to validate the findings. However, we offered them the opportunity to receive the study findings. Data collection occurred from June 2025 to January 2026 (Figure 2).

Figure 2. Study procedure (CAD $1=US $0.70 as of November 13, 2026).



Data Analyses

Quantitative Analysis

We used descriptive statistics to summarize participant demographics. We examined internal consistency to ensure that the items within each UTAUT construct measured the same underlying construct, using Cronbach α; values of 0.70 or above indicate strong internal consistency [52]. We assessed the normality of UTAUT construct scores using the Shapiro-Wilk test [53]. To examine dyad agreement, we calculated Spearman or Pearson rank-order correlations for each UTAUT construct and the overall summative scale score at both time points. Depending on the strength of correlation in responses between dyad members, we analyzed persons living with dementia or MCI and care partners either together or as independent samples [48].

Although partial least squares is a useful multivariate approach for modeling and testing relationships among UTAUT constructs, it generally requires a larger sample to produce stable and reliable estimates. Given the sample size of this study, we conducted two sets of analyses instead, using parametric or nonparametric methods based on data distribution: (1) within-group comparisons of the UTAUT summative scale score and individual construct scores between pre- and posttest, with between-group comparisons (persons living with dementia or MCI vs care partners; persons living with dementia vs MCI) at each time point; and (2) bivariate correlations among performance expectancy, effort expectancy, social influence, facilitating conditions, behavioral intention, and actual use.

For between-group comparisons, we rescaled care partner 5-point Likert scale responses to a 3-point scale: we collapsed "strongly disagree" and "disagree" (0-1) into "disagree" (0), retained "neither agree nor disagree" (2) as (1), and collapsed "agree" and "strongly agree" (3-4) into "agree" (2). We set the α level of significance at $P \leq .05$ (2-tailed). Given the exploratory nature of this pilot study, we did not apply adjustments for multiple statistical comparisons. We therefore report unadjusted *P* values and interpret statistically significant findings as exploratory. We performed all quantitative analyses using SPSS (version 28.0; IBM Corp).

Qualitative Analysis

We analyzed qualitative data from the 4 semistructured interviews using conventional content analysis as described by Hsieh and Shannon [54]. We selected this inductive approach because existing theory on GPS tracking acceptance among persons living with dementia or MCI and their care partners remains limited, making a data-driven analytic strategy appropriate. Rather than applying preconceived categories, we derived codes directly from the interview transcripts through repeated, immersive reading of the data. The analysis proceeded in 4 stages. First, the primary researcher (SA) transcribed all interviews verbatim and read each transcript repeatedly to achieve immersion in the data. Second, SA conducted systematic line-by-line annotation of each transcript, highlighting meaningful units of text and assigning descriptive codes and subcodes that captured key concepts close to the data. Third, SA reviewed the coded transcripts iteratively, refined the codes, and updated the codebook after each pass to reflect new insights and resolve inconsistencies. This iterative cycle continued until no new codes emerged and the codebook was stable. Fourth, the research team examined codes for relationships and shared meaning and organized them into higher-order categories representing the main dimensions of participants' experiences. Throughout all stages, 2 additional members of the research team (CD and AMC) independently reviewed the codes and emerging structure. All 3 researchers met weekly to discuss coding decisions, resolve discrepancies, and refine the analytical framework through consensus. Research team members verified emergent codes and categories through ongoing discussion until they reached consensus [54]. To enhance rigor during data collection and analysis, we adopted verification strategies including methodological coherence and concurrent data collection and analysis. We supplemented these verification strategies with trustworthiness strategies such as verifying data accuracy, peer debriefing, and keeping an audit trail [55]. We intended the qualitative findings to contextualize and expand upon the quantitative results, consistent with the supplementary role of the qualitative component within a multimethod design.

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We performed all qualitative analyses using Microsoft Word (version 365) and Microsoft Excel (version 365).

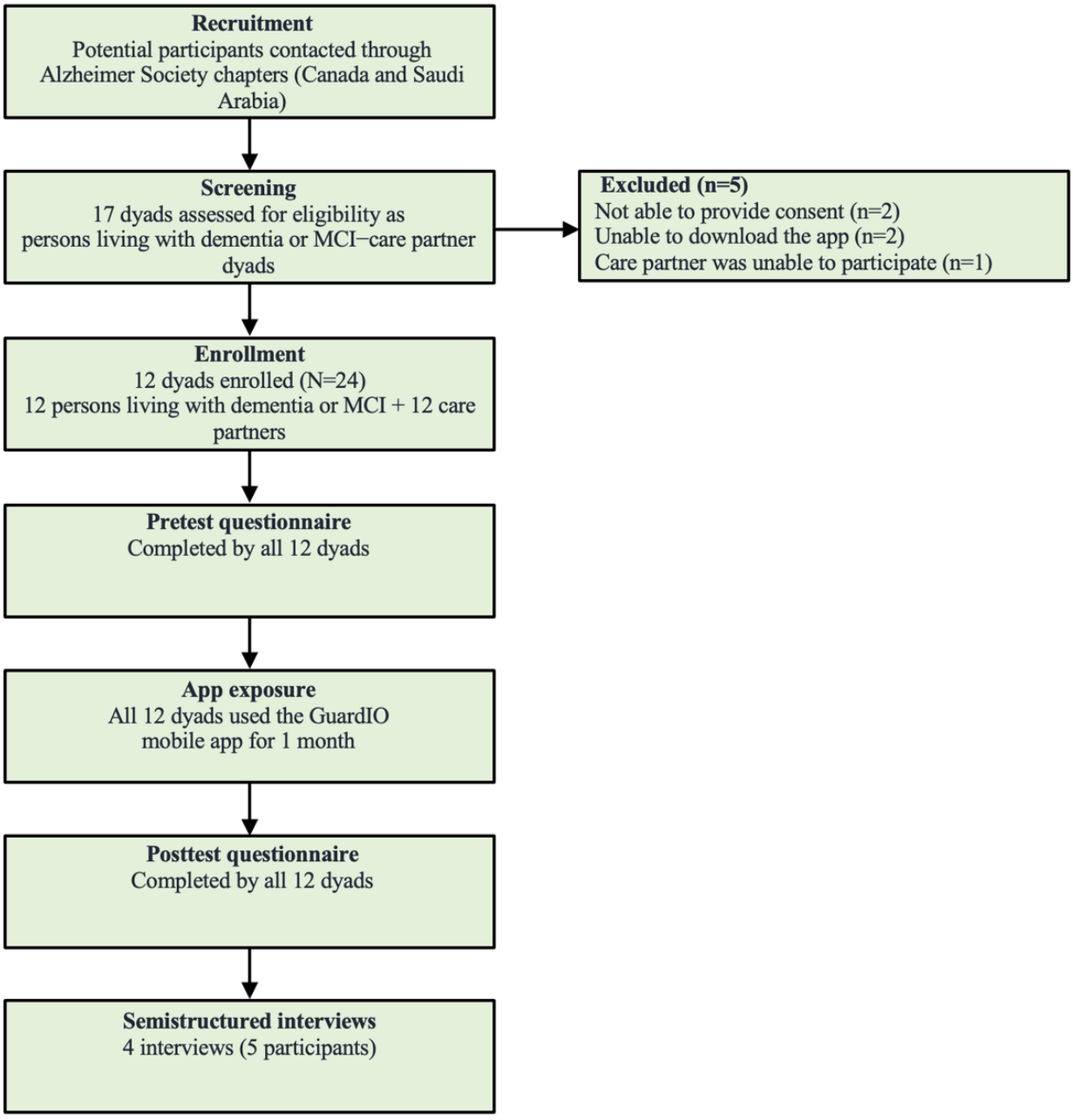
Results

Participants' Demographics

Figure 3 presents the flow of study participants. We assessed 17 dyads for eligibility. Of these, we excluded 5 dyads because 2 could not provide consent, 2 could not download the app, and 1 care partner could not participate. We enrolled the remaining 12 dyads, who completed the pre- and posttest questionnaires. No withdrawals occurred during the study. In addition, a subsample of 5 participants completed 4 semistructured interviews in the qualitative part of the study.

Table 1 summarizes participant demographics. Among persons living with dementia or MCI, the mean age was 67.2 (SD 8.5) years, and most were male (7/12, 58.3%). Regarding diagnosis, 7 (58.3%) participants reported having dementia, and 5 (41.7%) participants had MCI. Most participants reported being somewhat comfortable with digital technology (7/12, 58.3%), followed by comfortable (2/12, 16.7%), uncomfortable (2/12, 16.7%), and very comfortable (1/12, 8.3%). Care partners had a mean age of 51.2 (SD 19.7) years, with the majority being female (9/12, 75%). They reported an average of 5.6 (SD 3.4) years of care partner experience. Most care partners indicated being very comfortable with digital technology (7/12, 58.3%). We recruited dyads from Canada (9/12, 75%) and Saudi Arabia (3/12, 25%).

Figure 3. Flow of study participants. MCI: mild cognitive impairment.



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Table 1. Participant demographics.

Demographic	Persons living with dementia or MCI[a] (n=12)	Care partners (n=12)
Age (years), mean (SD)	67.2 (8.5)	51.2 (19.7)
Care partner experience (years), mean (SD)	N/A[b]	5.6 (3.4)
Sex, n (%)		
Male	7 (58.3)	3 (25)
Female	5 (41.7)	9 (75)
Others[c]	0 (0)	0 (0)
Diagnosis, n (%)		
Dementia	7 (58.3)	N/A
MCI	5 (41.7)	N/A
Technology comfort, n (%)		
Uncomfortable	2 (16.7)	0 (0)
Somewhat comfortable	7 (58.3)	2 (16.7)
Comfortable	2 (16.7)	3 (25)
Very comfortable	1 (8.3)	7 (58.3)
Country of residence, n (%)		
Canada	9 (75)	9 (75)
Saudi Arabia	3 (25)	3 (25)

[a]MCI: mild cognitive impairment.

[b]N/A: not applicable.

[c]Two-spirited/nonbinary/transgender/prefer not to disclose.

Quantitative Findings

Internal Consistency, Normality, and Dyad Agreement

Internal consistency ranged from acceptable to excellent across all constructs at both time points for the persons living with dementia or MCI questionnaire (α=0.806-0.984) and the care partner questionnaire (α=0.773-0.980). We observed 2 exceptions: facilitating conditions at pretest among persons living with dementia or MCI (α=0.690) and behavioral intention at pretest among care partners (α=0.557). Shapiro-Wilk tests revealed that the majority of UTAUT construct summative scale scores were significantly nonnormal in at least 1 participant group (P<.05), supporting the use of nonparametric tests for all subsequent analyses.

Dyad agreement varied across constructs and time points. At pretest, we observed moderate to strong positive correlations for performance expectancy, effort expectancy, facilitating conditions, and the overall summative scale score, while social influence and behavioral intention showed no statistical significance. At posttest, we observed statistically significant moderate positive correlations only for performance expectancy and actual use, while the remaining constructs, including the overall summative scale score, did not reach statistical significance. Given the inconsistent agreement across constructs and time points, we therefore treat persons living with dementia or MCI and care partners as independent samples in all subsequent analyses (see Multimedia Appendix 3 for more detail).

Within- and Between-Group Changes

Table 2 presents the technology acceptance and usability summative scale scores for the GuardIO app among persons living with dementia or MCI and care partners at pre- and posttest. Overall, mean scores were generally high at both time points for both groups, indicating high acceptance and usability of the GuardIO app. Among persons living with dementia or MCI, the mean summative scale score decreased significantly from pretest (mean 29.17, SD 7.2) to posttest (mean 22.17, SD 8.1; z=–2.09; P=.04). In contrast, although care partners showed a decrease in mean summative scale score from pretest (mean 31.18, SD 5.4) to posttest (mean 26.7, SD 10.5), this change was not statistically significant.

Among persons living with dementia or MCI, we observed a significant decrease only for the facilitating conditions construct (pretest: mean 6.00, SD 1.6; posttest: mean 4.50, SD 1.8; z=–2.37; P=.02). We found no significant changes for the remaining constructs (P>.05). Among care partners, we observed no statistically significant changes in any individual construct from pretest to posttest (all P>.05), although mean scores remained high across all constructs.

Between-group comparisons showed no statistically significant differences in summative scale scores between persons living with dementia or MCI and care partners at either the pretest or posttest phase. Among the individual UTAUT constructs, the only statistically significant between-group difference occurred for actual use at posttest (P=.02).

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We conducted additional between-group comparisons of UTAUT construct scores between persons living with dementia and those with MCI at pre- and posttest. We found no statistically significant differences between the 2 groups at either time point. We also compared the overall posttest UTAUT summative scale scores, including all 6 constructs (with actual use), between persons living with dementia or MCI and care partners and between persons living with dementia and those with MCI. Neither comparison showed statistically significant differences (see Multimedia Appendix 4 for more detail).

Table 2. Participants' acceptance and use of the GuardIO app (within-group and between-group analyses)[a].

Phase	Persons living with dementia or MCI[b] (n=12), summative scale score[c], mean (SD)	Care partners (n=12), summative scale score[c], mean (SD)	Mann-Whitney *U* test (between groups)	
			z score	*P* value
Pretest questionnaire	29.17 (7.2)	31.18 (5.4)	0.871	.41
Posttest questionnaire	22.17 (8.1)	26.7 (10.5)	1.648	.10

[a]Wilcoxon signed rank pairs test (within groups): for persons living with dementia or MCI: z=–2.09; *P*=.04 (statistically significant); for care partners: z=–0.63; *P*=.53.

[b]MCI: mild cognitive impairment.

[c]The summative scale score includes 5 UTAUT constructs measured at both pretest and posttest (19 items): performance expectancy, effort expectancy, social influence, facilitating conditions, and behavioral intention. The 3 actual use items, assessed only at posttest, were excluded from the overall posttest summative score to ensure comparability between pre- and posttest scores. The maximum possible summative score was therefore 38 points at both time points (3-point Likert scale).

Bivariate Correlations Among Constructs

Tables 3 and 4 present the bivariate correlations among the UTAUT constructs at posttest for persons living with dementia or MCI and for care partners, respectively. For persons living with dementia or MCI (Table 3), behavioral intention showed moderate positive correlations with performance expectancy (r_s=0.576; *P*=.04) and social influence (r_s=0.628; *P*=.02), but not with effort expectancy. In addition, actual use showed a moderate positive correlation with behavioral intention (r_s=0.711; *P*=.009), whereas facilitating conditions did not correlate significantly with actual use.

For care partners (Table 4), behavioral intention showed a strong positive correlation with performance expectancy (r_s=0.865; *P*<.001), and moderate positive correlations with effort expectancy (r_s=0.641; *P*=.02), facilitating conditions (r_s=0.693; *P*=.01), and actual use (r_s=0.733; *P*=.007). Social influence showed no significant correlation with behavioral intention (see Multimedia Appendix 4 for more detail).

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Table 3. Bivariate correlations among unified theory of acceptance and use of technology constructs at posttest for persons living with dementia or mild cognitive impairment (Spearman rank-order correlations).

Construct	Performance expectancy	Effort expectancy	Social influence	Facilitating conditions	Behavioral intention	Actual use
Performance expectancy						
r	1.000	0.323	0.832	0.210	0.576	0.600
P value	—[a]	.31	<.001	.51	.04	.40
Effort expectancy						
r	0.323	1.000	0.035	0.758	–0.131	0.319
P value	.31	—	.91	.004	.68	.31
Social influence						
r	0.832	0.035	1.000	0.080	0.628	0.581
P value	<.001	.91	—	.80	.02	.40
Facilitating conditions						
r	0.210	0.758	0.080	1.000	0.211	0.416
P value	.51	.004	.80	—	.51	.17
Behavioral intention						
r	0.576	–0.131	0.628	0.211	1.000	0.711
P value	.04	.68	.02	.51	—	.009
Actual use						
r	0.600	0.319	0.581	0.416	0.711	1.000
P value	.40	.31	.40	.17	.009	—

[a]Not available.

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Table 4. Bivariate correlations among unified theory of acceptance and use of technology constructs at posttest for care partners (Spearman rank-order correlations).

Construct	Performance expectancy	Effort expectancy	Social influence	Facilitating conditions	Behavioral intention	Actual use
Performance expectancy						
r	1.000	0.507	0.330	0.652	0.865	0.740
P value	—[a]	.09	.29	.02	<.001	.006
Effort expectancy						
r	0.507	1.000	0.055	0.568	0.641	0.350
P value	.09	—	.86	.05	.02	.26
Social influence						
r	0.330	0.055	1.000	0.068	0.171	0.125
P value	.29	.86	—	.83	.59	.69
Facilitating conditions						
r	0.652	0.568	0.068	1.000	0.693	0.545
P value	.02	.05	.83	—	.01	.06
Behavioral intention						
r	0.865	0.641	0.171	0.693	1.000	0.733
P value	<.001	.02	.59	.01	—	.007
Actual use						
r	0.740	0.350	0.125	0.545	0.733	1.000
P value	.006	.26	.69	.06	.007	—

[a]Not available.

Qualitative Findings

Overview

Of the 24 participants who completed the study, 5 (20.8%) took part in 4 semistructured interviews: 2 persons living with dementia and 3 care partners. Participants had a mean age of 62.6 (SD 15.84) years, and 80% (4/5) identified as male. One person living with dementia-care partner dyad completed a joint interview; the remaining 3 participants completed individual interviews. Analysis of the interview data yielded two key categories: (1) adoption factors and (2) functionality, usability, and data privacy (Table 5).

Table 5. Categories, codes, and subcodes generated from the data.

Categories and codes	Subcodes
Adoption factors	
Fit and adoption	• Useful in early dementia • Safety influences adoption • Digital literacy influences adoption
Perceived usefulness	• Care partners' benefit • Care partners' peace of mind • Tracking enables the independence of persons living with dementia
Functionality, usability, and data privacy	
Technical performance	• Battery drain • Inaccurate tracking • Complex setup
Data privacy	• Data transparency

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Category 1: Adoption Factors

This category encompasses the factors that shaped participants' decisions to adopt the GuardIO app and their appraisals of its usefulness within the persons living with dementia or MCI and care partner relationship. We organized these factors into two codes: (1) fit and adoption and (2) perceived usefulness.

The fit and adoption code reflects why participants chose to use the GuardIO app and why it was appropriate for their caregiving relationship. We identified three subcodes: (1) useful in early dementia: the GuardIO app was most useful during the early stages of dementia, when persons living with dementia retained sufficient cognitive ability to carry and operate a smartphone independently. (2) Safety influences adoption: concerns about the persons living with dementia's physical safety, particularly the risk of becoming lost or disoriented during outings, were the most frequently cited motivation for adopting the GuardIO app. (3) Digital literacy influences adoption: limited familiarity with technology created adoption barriers for some participants. While all 3 subcodes were present across participant excerpts, the most salient subcode was useful in early dementia. It emerged unprompted across interviews and was discussed by both persons living with dementia and their care partners.

Participants reported that the GuardIO app was most useful when persons living with dementia retained sufficient cognitive ability to use it. One care partner described this directly, questioning whether consistent use of the GuardIO app was a realistic expectation for someone who already struggled with basic daily activities such as medication adherence:

> *He has Alzheimer's [Participant refers to his brother-in-law], and sometimes he forgets to take the pill as well. So, how do you expect he will use the app every day?* [Participant 2, care partner]

Another care partner, the person living with dementia's wife, reflected on a time when her husband was still driving independently and noted that real-time location tracking would have been particularly valuable then:

> *If he had been driving, that [the GuardIO application] might be useful because then we could see what was happening with his driving and what the patterns were.* [Participant 1, care partner]

This excerpt suggests that the GuardIO app is less valuable as dementia progresses. Participant 1's excerpt suggests that the GuardIO app was most relevant during a specific window in the dementia trajectory. Another care partner also identified the limits of the GuardIO app's usefulness as the condition worsens for the person living with dementia; the cognitive and functional abilities the app relies on, such as carrying the phone, keeping it charged, sending an SOS message, and understanding its purpose, are precisely those most affected by progressive cognitive and physical decline:

> *Because if the person living with dementia is getting worse [persons living with dementia condition getting worse], then they may not know how to use this tool anymore [GuardIO application].* [Participant 2, care partner]

Together, these interview accounts suggest that participants considered the GuardIO app most useful when persons living with dementia retained sufficient cognitive ability to use a smartphone independently.

The code perceived usefulness reflects how location tracking shaped the relationship between persons living with dementia and their care partners, who benefited from its use, and the impact of location tracking on the person living with dementia and their care partners. We identified three subcodes: (1) care partners' benefit: care partners experienced the benefits of the GuardIO app more directly than persons living with dementia. (2) Care partners' peace of mind: real-time location tracking reduced care partner anxiety, enabling them to continue their daily activities while staying aware of the person living with dementia's whereabouts. (3) Tracking enables independence of persons living with dementia: location tracking supported the person living with dementia in maintaining outdoor mobility and community participation by providing a safety net that allowed them to move more freely without requiring direct supervision. Together, these subcodes form a coherent picture of who benefits from location tracking, and how those benefits are distributed between the person living with dementia and care partners. We describe each below.

Participants consistently described the GuardIO app as more valuable to care partners than to the person living with dementia, and care partners actively used it to monitor the person's location. One care partner noted:

> *The more practical use of the app is for the care partners supporting the patient with Alzheimer's disease.* [Participant 2, care partner]

The same care partner added that monitoring was one-directional:

> *This tool [GuardIO application] is very simple to use and also focused on tracking the Alzheimer's patients; you don't expect an Alzheimer's patient to check the caregiver.* [Participant 2, care partner]

One person living with dementia noted little personal benefit:

> *For me, I don't see anything special in this app for the person with dementia, except that one of my caretakers has some knowledge about my location.* [Participant 3, person living with dementia]

Given that care partners were the primary beneficiaries of the GuardIO app, it follows that they also experienced the most salient outcomes. Care partners consistently reported that location tracking reduced their anxiety, providing peace of mind in their day-to-day caregiving. One care partner stated:

> *I would say mainly, it gave us peace of mind.* [Participant 4, care partner]

Another care partner explained that location monitoring allowed a family member to extend the duration of routine outings without concern for the person living with dementia's whereabouts:

> *The caregiver [sister] right now feels more comfortable going outside to buy things instead of*

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> *going only for five minutes.* [Participant 2, care partner, describing another care partner's experience]

However, one care partner was explicit about the limits of location-based monitoring: while location tracking provided a degree of comfort, knowing the person living with dementia's location did not confirm their physical safety or well-being:

> *I don't think that the GuardIO made him safer than the other things we were using. There was more information, and just again, one more thing tracking where he is. Is he actually safer? I don't think so.* [Participant 1, care partner]

Another care partner also noted that tracking shows the location, but cannot prevent the person living with dementia from going to the wrong place:

> *Even with a tracker, now he's [person living with dementia] at Costco. But that doesn't mean he's at the right Costco.* [Participant 2, care partner]

Although care partners experienced the primary benefits, several accounts indicated that location tracking also helped the person living with dementia maintain independence in community-based activities without direct supervision. One care partner noted that tracking extended the duration of unsupervised outings and allowed monitoring of whether the person living with dementia remained within a familiar area:

> *Now they [person living with dementia] can go out longer, and also they can track whether they're within the safe zone.* [Participant 2, care partner]

Another care partner described how knowing the location of the person living with dementia changed their response when they go for a walk:

> *And having the tracking makes me, if he wants to go for the walk, I'm like, yeah, okay.* [Participant 1, care partner]

A third care partner noted that tracking supported the person living with dementia in initiating meaningful community activities, including attending the mosque and visiting familiar places independently:

> *I think it gave him [person living with dementia] more freedom, more independence to just leave the house whenever he wants before returning to us, saying like, I'm going to go to the mosque, or I'm going to go to that place.* [Participant 4, care partner]

Together, these findings suggest that the GuardIO app primarily benefitted the care partner but also supported the independence of the person living with dementia in the community. Nonetheless, the app had inherent limitations: it confirmed whereabouts but could not confirm safety or well-being. The following category examines the design and technical factors shaping those limits.

Category 2: Functionality, Usability, and Data Privacy

This category represents the technical and privacy-related factors that shaped the effectiveness of the GuardIO app in location monitoring. We organized these factors into two codes: (1) technical performance and (2) data privacy.

The code technical performance encompasses participants' experiences of how the GuardIO app operated under everyday conditions and the extent to which its technical features supported or hindered use. We identified three subcodes: (1) battery drain: substantial depletion of smartphone charge caused by continuous GPS activity, which prevented reliable use throughout the day. (2) Inaccurate tracking: GPS inaccuracies occurred when users operated devices under low-power settings. (3) Complex setup: participants' descriptions of initial setup as a significant barrier to effective use, particularly the steps required to create and join care circles, manage battery and accuracy settings, and navigate available configuration options. Among the 3 subcodes, participants consistently reported battery drain, which we describe below.

Participants most consistently reported battery drain as a technical limitation. Participants described the continuous GPS activity as substantially depleting smartphone charge, often within hours, to the point where sustained daily use became impractical. One care partner captured the frustration plainly:

> *It [GuardIO application] certainly sucked battery life out of the phones.* [Participant 1, care partner]

The same care partner noted that by the end of the study, the battery drain had become significant enough to affect her willingness to continue using the GuardIO app:

> *The battery issue, when we were done with the study, I was quite happy to take it [GuardIO application] off my phone.* [Participant 1, care partner]

Continuous GPS tracking drained the device to near-zero within hours, undermining the GuardIO app's core function, one care partner noted:

> *It [GuardIO application] does bring down the power consumption from roughly 14% in four hours on my Samsung phone and then to less than 1%. So it consumed very fast.* [Participant 2, care partner]

For care partners already managing multiple demands, this added pressure on device performance was a significant burden. As one care partner explained:

> *I mean, mainly, it was the battery life thing. It was draining the battery very quickly, meaning, especially since you know how smartphones work with all the applications. So, an extra burden on the phone can be very bad on the phone.* [Participant 4, care partner]

The burden extended beyond inconvenience for care partners. For persons living with dementia, the need for frequent charging posed a practical challenge, as they may have difficulty recognizing when their phone requires charging or remembering to charge it regularly. One person living with dementia noted:

> *A person who has dementia who doesn't know whether their battery is full or not.* [Participant 3, person living with dementia]

Battery drain was more than a technical inconvenience. During situations requiring real-time location tracking, such as unplanned outings where a person living with dementia became disoriented, a depleted battery prevented the care partner from

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accessing the GuardIO app's location-tracking features at critical moments.

The code data privacy reflects participants' concerns about surveillance, undisclosed data collection, and third-party access to their data. We identified one subcode: data transparency: it relates to participants' uncertainty about what data the app collected, how the app stored those data, who could access them, and for what purposes. Participants discussed data transparency most consistently; we describe it below.

A recurring concern across interviews was not simply that the app collected data, but that participants did not know where those data went or who could see them. One participant articulated:

> *But the main thing for us was, who's looking at the data [Data collected from the GuardIO application]? Who knows where we live? Who can see that data?* [Participant 4, care partner]

For some participants, this uncertainty deepened when they discovered the app had been collecting information beyond what they had anticipated. One care partner expressed surprise that the app recorded her driving behavior alongside location data and immediately recognized the potential consequences of that data reaching third parties:

> *It collected information I didn't know it would collect. When we were driving, it gave me feedback on how many speeding incidents I'd have. And who has access to that? If the insurance companies have access to it, it can certainly be used to say, look at you, you're not driving safely.* [Participant 1, care partner]

The gap between what participants understood they had consented to and what the app was collecting raised questions about transparency. The same care partner described navigating the privacy documentation through trust rather than comprehension:

> *I read it, and it's overwhelming. We were participating in it, so I'm downloading it. I have trust that things have been done right.* [Participant 1, care partner]

Taken together, these excerpts reflect a pattern of unresolved uncertainty; participants did not fully understand what data the GuardIO app collected, who could access it, or how others might use it. Participants found the privacy documentation too complex to evaluate meaningfully, leading them to rely on trust rather than informed comprehension. These unresolved transparency concerns pose a barrier to adoption.

Discussion

Main Findings

This pilot study evaluated the acceptance and usability of the GuardIO app among persons living with dementia or MCI and their care partners in community settings, following the usability validation stage of the V3+ digital health framework for sensor-based digital health technologies [39]. We found that (1) overall mean acceptance and usability summative scores across both groups and time points were generally high, indicating high acceptance and usability; (2) performance expectancy showed the strongest bivariate association with behavioral intention in this sample; and (3) behavioral intention correlated with actual use. Qualitative findings contextualized the quantitative results: the app's value derived from its ability to provide peace of mind for care partners and location monitoring while also enabling persons living with dementia or MCI to participate in community-based activities without direct supervision. Technical limitations, support requirements, and concerns about data privacy constrained actual use.

This pilot study makes 2 contributions. First, it demonstrates a practical application of the V3+ usability validation framework to a smartphone-based GPS location-monitoring app used by persons living with dementia or MCI and their care partners in community settings. Although researchers have primarily used V3+ in the context of digital health technology validation, the present findings illustrate how usability barriers that emerge during real-world deployment may hinder sustained adoption, even when initial acceptance is high. These observations offer preliminary empirical support for the framework and underscore the value of larger, more diverse studies that apply V3+ in similar contexts. Second, the findings carry practical implications for developers of digital health technologies, particularly SMEs serving vulnerable populations. Several barriers identified in this study became apparent only after participants used the app in their daily lives, suggesting that community-based usability evaluation can surface issues that laboratory testing alone may miss. By identifying and addressing such barriers early, developers may maximize user acceptance and support the long-term viability of digital health technologies intended for routine community use.

Performance expectancy (ie, the perceived usefulness of the GuardIO app) correlated significantly with behavioral intention in both groups. This aligns with previous research showing that, among the 4 UTAUT constructs, performance expectancy is generally the strongest predictor of behavioral intention to use a technology [13,41,56]. The participants' interviews supported and extended this finding. Care partners described the clear value of real-time location monitoring, which reduced anxiety and provided peace of mind when the person living with dementia or MCI was outside the home, allowing them to extend the duration of unsupervised trips with greater confidence. Location tracking also supported the person living with dementia or MCI in participating in community-based activities without direct supervision, including attending the mosque and routine trips that would otherwise have required accompaniment. These observations are consistent with prior GPS acceptance research in dementia care, in which care partners similarly described location monitoring as providing peace of mind and enhancing safety for the person being tracked [13,26]. Nevertheless, interviews suggested that members of the caregiving dyad experienced the perceived benefits asymmetrically. Whereas care partners experienced direct and immediate value through the app itself, persons living with dementia or MCI struggled to identify personal benefits beyond allowing others to know their location. The benefit to persons living with dementia or MCI was indirect, experienced through the freedom that tracking created rather than through the app's function [57]. As a result,

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care partners may perceive large value in these technologies, whereas the individual being monitored may experience fewer direct or meaningful benefits. Consistent with this, care partners demonstrated significantly higher actual use of the GuardIO app than persons living with dementia or MCI at posttest, further supporting their role as the primary users and beneficiaries of the GuardIO app. This finding suggests that evaluations of sensor-based digital health technologies should consider the perspectives of both members of the caregiving dyad, as perceived usefulness may differ depending on whether an individual is the primary user or the primary beneficiary.

The findings further suggest that the perceived usefulness of sensor-based digital health technologies, especially smartphone-based location monitoring technologies, may depend on the timing of their use within the dementia trajectory. Participants indicated that GuardIO was most appropriate during the early stages of cognitive decline, when individuals retained sufficient cognitive ability to carry, charge, and manage a smartphone, which is consistent with evidence that GPS tracking is most feasible and acceptable in the early stages of dementia [12]. As cognitive impairment progresses, these requirements may become increasingly difficult to meet, reducing the feasibility of smartphone-dependent solutions [58]. This finding has implications for implementation; technologies introduced too late in the disease trajectory may fail not because they lack value, but because the functional capabilities required for their use are no longer available [59-61]. Conversely, introducing technologies during earlier stages may allow individuals and families to establish routines and become familiar with the technology before greater support needs emerge. These observations suggest that discussions about location-monitoring technologies may be most productive early in the cognitive impairment care pathway and point to a potential role for health care providers and occupational therapists in facilitating the timely adoption of such technologies.

Although perceived usefulness supported acceptance, sustained use appeared to depend on more than just perceived usefulness. The quantitative findings showed a decline in posttest summative scores for facilitating conditions; this finding is consistent with prior GPS acceptance research in dementia care, which identified facilitating conditions as a factor influencing actual use [13,62]. Interviews provided context for this decline. Participants most consistently identified battery drain as a technical limitation and reported that continuous GPS use substantially depletes smartphone charge within hours. Qualitative data suggest that this may have contributed to the observed decline in facilitating conditions scores, though causal attribution cannot be established from this design. This result is consistent with previous studies in which users mentioned similar problems and concerns [13,63]. One care partner described the drain as making the app “an extra burden on the phone” and noted that by the end of the study, she was “quite happy to take it off.” For persons living with dementia or MCI, this concern carries greater weight: unlike care partners, persons with cognitive decline may not reliably recognize or respond to a low-battery notification, meaning that power depletion can silently eliminate the app’s safety function at the moment it is most needed [22]. Future technology improvements, such as the GuardIO app, should prioritize reducing battery consumption through more efficient GPS tracking and power management strategies to support reliable long-term use in everyday settings.

Data privacy emerged as an additional concern with direct implications for user satisfaction and long-term acceptance. Participants described difficulty understanding the scope of data collection; one care partner expressed surprise that the app had logged her own driving behavior alongside location data, and another described navigating privacy documentation by trusting it rather than through genuine comprehension. These accounts are notable for participants with cognitive decline and their care partners, who may have reduced digital health literacy and limited capacity to evaluate data privacy documentation, increasing vulnerability to unanticipated data collection and undermining genuinely informed consent [64]. The V3+ framework explicitly defines user satisfaction as encompassing trust and comfort [39], and research in mHealth has demonstrated that trust and perceived risk are independent factors influencing technology use, distinct from perceived usefulness and ease of use [65]. When users are uncertain about what data the app collects, who can access it, and how those parties may use it, this uncertainty compromises user satisfaction even when the technology’s functional performance is intact. Plain-language disclosure, user control over data collection, and transparent in-app documentation may therefore be important components for achieving the user satisfaction standard required by V3+ usability validation and warrant attention in future design iterations.

Limitations

Several limitations should be considered when interpreting these findings. First, the sample was small, which limits generalizability to broader populations of persons living with dementia or MCI and their care partners. The quantitative analyses were descriptive and bivariate, and multiple statistical comparisons were conducted without adjustment, increasing the risk of type I errors (false-positive findings). Therefore, statistically significant findings should be interpreted as exploratory and require confirmation in larger studies before drawing conclusions about the relative importance of UTAUT constructs in this population. Second, we recruited participants via convenience sampling through Alzheimer Society chapters in Canada and Saudi Arabia, which may introduce potential self-selection bias. Individuals who volunteer for technology studies may be more motivated, technologically confident, or more favorably disposed toward innovation than the broader caregiving population [66]. Third, the sample spanned multiple generations, and generational differences in technology use and expectations may have further influenced digital health adoption and acceptance patterns in ways that we did not systematically capture [67]. Fourth, the qualitative component involved only 5 participants, 2 persons living with dementia and 3 care partners across 4 interviews. Although this provided contextual insight, it is insufficient to claim data saturation and may not capture the full range of caregiving experiences. In particular, the reported excerpts underrepresent the perspectives of persons living with dementia or MCI relative to care partners, and we therefore draw conclusions about the perceived benefits for persons living with dementia or MCI largely from care-partner

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accounts; this imbalance should be considered when interpreting findings related to the experience of persons living with dementia or MCI specifically. Finally, participants used their own smartphones, reflecting real-world deployment on devices they routinely used. At the same time, this introduced variability in hardware and operating system performance that may have influenced GPS accuracy and battery consumption in ways not attributable solely to the app, limiting cross-device generalizability.

Conclusions

This pilot study demonstrates that persons living with dementia or MCI and their care partners perceived the GuardIO app as useful, with performance expectancy showing a significant correlation with behavioral intention in both groups. In addition, behavioral intention correlated with actual use in both groups. The app's primary value was its ability to support real-time location monitoring, enhance care partner peace of mind, and promote independent community participation among persons living with dementia or MCI. Although participants recognized the GuardIO app's potential benefits, technical limitations and data privacy concerns encountered during real-world deployment hindered sustained use. For SMEs developing digital health technologies, these findings suggest the importance of iterative usability evaluation and address technical and privacy-related challenges to support long-term adoption.

Funding

This work was supported by the AGE-WELL Catalyst Funding Program in Healthy Aging (award AW-CAT-2023-08). SA was also supported by a PhD scholarship from King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Saudi Arabia.

Data Availability

The datasets generated or analyzed during this study are available from the corresponding author on reasonable request.

Generative AI Use

During manuscript preparation and revision, ChatGPT (OpenAI) was used to assist with improving language, grammar, and clarity. Generative AI was not used to develop research ideas, design the study, analyze data, or generate scientific findings or conclusions. The authors reviewed all suggested edits and remained responsible for the accuracy and integrity of the manuscript.

Authors' Contributions

SA contributed to conceptualization, methodology, investigation, data curation, formal analysis, project administration, visualization, writing the original draft, and reviewing and editing the manuscript. CD contributed to conceptualization, methodology, investigation, formal analysis, and reviewing and editing the manuscript. AMC contributed to conceptualization, methodology, investigation, formal analysis, supervision, project administration, and reviewing and editing the manuscript. VEE, SE, and LL contributed to reviewing and editing the manuscript.

Conflicts of Interest

The authors have no financial relationships with WeTraq, the company that developed the GuardIO app. WeTraq provided participants with app access at no cost to the research team.

Multimedia Appendix 1

Pretest and posttest technology acceptance and usability questionnaires and semistructured interview.
[DOCX File , 27 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Teach-back approach to informed consent.
[DOCX File , 147 KB-Multimedia Appendix 2]

Multimedia Appendix 3

Internal consistency, normality, and dyad agreement analyses.
[DOCX File , 31 KB-Multimedia Appendix 3]

Multimedia Appendix 4

Within and between-group comparisons and bivariate correlations.
[DOCX File , 38 KB-Multimedia Appendix 4]

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Abbreviations

MCI: mild cognitive impairment
mHealth: mobile health
SME: small- and medium-sized enterprise
UTAUT: unified theory of acceptance and use of technology

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Edited by N von Kalckreuth; submitted 22.Jul.2026; peer-reviewed by A Iaboni, R Marshall; comments to author 26.Sep.2026; revised version received 26.Oct.2026; accepted 03.Nov.2026; published 23.Nov.2026

Please cite as:
Alshammari S, Daum C, E Ezeugwu V, Esmail S, Liu L, Miguel Cruz A
Technology Acceptance and Usability of the GuardIO mHealth App Among Persons Living With Dementia or Mild Cognitive Impairment and Their Care Partners: Multimethods Study
JMIR Hum Factors 2026;13:e107718
URL: https://humanfactors.jmir.org/2026/1/e107718
doi: 10.2196/107718
PMID:

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