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User Experience Research on Age-Friendly Products for the Elderly: Case Study in China

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ABSTRACT

This study investigates how cultural factors shape elderly users' acceptance of age-friendly products in China, where the market remains transitional compared to mature Western systems. Using a mixed-methods approach involving 300 participants aged 60+ from urban and rural regions, the research combines structured surveys, interviews, and independent samples t-tests. Results indicate that lifestyle routines, family-centered decision-making, and health beliefs significantly influence usability perception, trust, and adoption willingness. Chinese seniors favor emotionally supportive and family-integrated products over autonomy-driven designs. The study proposes culturally adaptive, human-centered design strategies to enhance product acceptance, emotional well-being, and independent yet socially connected aging.

Keywords: Age friendly products, Cross culture design, User experience (Chinese elderly)

INTRODUCTION

Global population aging has become a critical societal issue, with the number of people aged 60 and above projected to exceed 2 billion by 2050, making China the largest aging nation (UN, 2022). This demographic shift presents significant challenges for healthcare, elderly care systems, and the design of age-friendly intelligent products. In Western countries, smart elderly care technologies—such as intelligent pill dispensers and health monitoring systems—have developed within a user-centered framework that emphasizes individual autonomy, privacy, and independent living. However, when such products are introduced into the Chinese context, their usability and acceptance are often limited due to cultural differences. Chinese elderly users generally rely more on family support, emotional reassurance, and community involvement, rather than fully autonomous self-management.

Smart medication reminder systems serve as a representative example in analyzing cross-cultural differences in product adoption. Western systems typically integrate automated dispensing, behavioral tracking, closed-loop remote monitoring, and privacy protection (Faisal et al., 2023), whereas Chinese products tend to prioritize affordability, basic prompting functions, and family-assisted supervision. However, issues such as cognitive overload, low trust, and emotional detachment often hinder long-term usage among Chinese elderly users (Hu, 2023). Therefore, there is an urgent need to

explore how cultural values, emotional expectations, and practical usability affect elderly users' experience and willingness to adopt smart medication reminders.

This study aims to investigate the key usability barriers, functional needs, and emotional responses of Chinese elderly users when interacting with intelligent medication reminder products. It seeks to reveal the cultural mechanisms shaping trust, satisfaction, and adoption intention. The findings contribute theoretically by introducing a culture-based user experience framework and practically by providing localized design strategies that enhance usability, emotional connection, and long-term adherence. Ultimately, this research supports the development of age-friendly intelligent products that are both technologically efficient and culturally resonant in the Chinese elderly care context.

Global Overview of Age-Friendly Smart Products and Smart Medication Reminders

As global aging intensifies, smart health management devices have become crucial for improving seniors' quality of life. The World Health Organization's healthy aging framework emphasizes maintaining functional ability, encouraging the use of smart products to support independence and health self-management (World Health Organization, 2021). Smart Medication Adherence Products (SMAPs) are prominent examples, widely used in home and community care (Faisal et al., 2023). These devices enhance medication adherence and reduce missed or duplicate doses through automated dispensing, audio/visual reminders, and data tracking (Arain, 2021). Liang et al. (2023) proposed a system using companion robots and wearables for closed-loop reminder-confirmation-recording management, significantly improving acceptability among older adults. SMAPs have evolved from simple mechanical reminders into integrated systems with remote monitoring and health feedback capabilities (Salmensuu et al., 2025). By connecting to healthcare platforms, they enable holistic health management, forming a key part of the global smart aging ecosystem (Faisal et al., 2023; Suzuki, 2024). Vieira et al. (2021) demonstrated that electronic pillboxes with alarm functions significantly improve medication adherence and stabilize blood pressure in elderly hypertensive patients.

User-Centered Design Principles for Chinese Older Adults

User-Centered Design (UCD) is proven to enhance acceptance and satisfaction among elderly users. Wang (2023) identified visual impairment, memory decline, and limited dexterity as primary barriers for Chinese seniors, recommending large fonts, simplified steps, and voice prompts to improve usability and adherence. Faisal et al. (2023) highlighted that reducing information density and using color/icon differentiation are key to minimizing cognitive load. Olaleye (2024) emphasized emotional design, showing that gentle, encouraging messages alleviate anxiety and promote sustained use.

Applying the Technology Acceptance Model (TAM), Zhou (2024) identified perceived usefulness, ease of use, social influence, and behavioral intention as core determinants for smart home adoption among the elderly. In the Chinese context, Wei et al. (2023) found that family support and community recommendations significantly boost adoption willingness. Huang et al. (2022) identified trust and privacy concerns as critical for continued use, while Hung (2023) attributed this to a cultural preference for collective decision-making and reliance on familial or medical authority.

Cultural Characteristics and Usage Preferences of Chinese Seniors

Chinese older adults exhibit strong familial attachment and collectivist orientations. Wei et al. (2023) demonstrated that instrumental and emotional support from children significantly enhances perceived ease of use and adoption intention. Hung (2023) noted that recommendations from family or community often outweigh individual preference, with cost and service accessibility being major constraints.

Emotional factors are paramount; respectful and encouraging prompts enhance feelings of being cared for, fostering acceptance (Wei et al., 2023). Economically, seniors show high price sensitivity, preferring "core-feature, low-cost" versions (Hung, 2023).

Regional and educational disparities significantly impact usage. Cao (2022) found that lower education and cognitive impairment increase dependence on family or community assistance. Jiang et al. (2024) reported a substantial urban-rural digital health literacy gap, with rural elders relying more on in-person training. Luo et al. (2024) suggested that mHealth devices should be designed as "socio-emotional tools" embedded within support networks, as trust and social interaction are crucial for long-term use.

Challenges in the Practice of Smart Medication Reminders in China

Despite rapid industry growth, several challenges persist. Device functionality is often compromised by network instability, and issues with false alarms/missed doses and packaging compatibility undermine user trust (Hu, 2023; Faisal et al., 2023). Inadequate technical support, product homogeneity, and a lack of unified standards hinder large-scale adoption and data interoperability (Hu, 2023; Wang, 2023). Hung (2022) emphasized that "cost, accessibility, and community service" are critical barriers. Wang et al. (2024) identified significant regional demand disparities linked to demographics, socioeconomic status, and smart aging knowledge.

Chapter Summary

Existing literature is rich in technical efficacy but lacks empirical studies on cultural adaptation, emotional experience, and long-term motivation for Chinese seniors. A systematic analysis covering urban-rural disparities, family collaboration mechanisms, and contextualized interaction design is notably absent. This study employs a mixed-methods approach to address these gaps by focusing on the behavioral habits, psychological perceptions,

and emotional preferences of Chinese older adults, aiming to formulate actionable, localized design recommendations.

Methodology

Table 1: Reliability statistics.

Measure	Value	Items
Cronbach's Alpha	.894	26
Cronbach's Alpha Based on Standardized Items	.890	26

Reliability analysis of the 26-item scale showed excellent internal consistency, with Cronbach's $\alpha = 0.894$ and standardized $\alpha = 0.890$, well above the 0.7 threshold, confirming strong measurement reliability for subsequent analysis.

Reliability analysis confirmed robust internal consistency across the three core dimensions, with Cronbach's α coefficients ranging from 0.913 to 0.926. Descriptive statistics revealed a hierarchical pattern in elderly users' attitudes: the Perceived Usability dimension received moderate ratings ($M = 3.15$–3.31), while the Trust and Emotional Connection dimension showed systematically higher scores ($M = 3.68$–3.82). The Social Support dimension demonstrated stable performance ($M = 3.43$–3.56). These results indicate progressively stronger user acceptance moving from functional aspects to emotional and social dimensions, confirming the measurement instrument's validity for assessing smart medication device adoption among elderly users.

Table 2: KMO and Bartlett's test.

Measure	Value
KMO Measure of Sampling Adequacy	.946
Bartlett's Test of Sphericity	Approx. Chi-Square: 4669.507 df: 325 Sig.:.000

To examine the scale's structural validity, KMO and Bartlett's sphericity tests were conducted. The results showed a KMO value of 0.946 and Bartlett's test of sphericity reached significance ($\chi^2 = 4669.507$, $df = 325$, $p < 0.001$), indicating the data's suitability for factor analysis. Principal component analysis with varimax rotation extracted three common factors with eigenvalues greater than 1, collectively explaining 61.570% of the total variance. All items demonstrated factor loadings exceeding 0.67 on their primary factors without cross-loading issues, revealing a clear factor structure that aligns well with the theoretical framework, thereby confirming strong structural validity of the scale.

Table 3: ANOVA results summary (N = 306).

Factor	Group	N	Perceived Usability	Trust & Emotional Connection	Social Support	Significance Pattern
Education	Primary or below	82	2.85	2.89	2.79	Primary < Other groups
	Junior high	128	3.47	3.50	3.32	
	High school	96	3.81	3.85	3.60	
	F/p-value		F = 17.793, p<.001	F = 15.646, p<.001	F = 9.763, p<.001	
Residence	Urban	250	3.07	3.57	3.36	Urban < Rural
	Rural	56	4.13	4.14	4.27	
	F/p-value		F = 52.151, p<.001	F = 13.986, p<.001	F = 35.661, p<.001	
Digital Experience	Never use	28	2.96	2.89	2.79	Inexperienced < Experienced
	Rarely use	68	3.01	3.43	3.32	
	Proficient	93	3.70	3.99	3.80	
	F/p-value		F = 6.553, p<.001	F = 8.497, p<.001	F = 5.759, p<.001	
Age Group	60–69	154	3.47	3.89	3.77	Younger > Older
	70–79	85	3.04	3.59	3.42	
	80+	67	3.06	3.30	3.09	
	F/p-value		F = 6.346, p=.002	F = 8.113, p<.001	F = 10.049, p<.001	

The study first verified the measurement instrument's reliability, demonstrating strong psychometric properties. Descriptive statistics indicated generally positive attitudes among elderly users, particularly in the trust and emotional connection dimension (M = 3.68–3.82). However, ANOVA results revealed significant within-group differences, outlining four distinct user demarcations: First, a digital divide emerged where technology-inexperienced elders constituted a "technologically disadvantaged group" facing the greatest barriers in operational ease and trust building. Second, an education barrier showed systematically lower ratings across all dimensions among less-educated seniors. Third, a geographical pattern unexpectedly revealed stronger demand and acceptance among rural users than urban counterparts, potentially driven by more pressing healthcare needs. Fourth, an age-related decline showed markedly decreasing acceptance with advancing age, reflecting the dual challenges faced by the oldest-old. These findings collectively demonstrate that the elderly population is far from homogeneous, with attitudes and needs being co-shaped by digital literacy, educational background, geographical location, and age cohort.

CONCLUSION

This study demonstrates that cultural values fundamentally shape Chinese older adults' acceptance of smart medication reminders. Users strongly preferred family-collaborative features over individual-focused designs, with emotional interaction being crucial for sustained use. While perceived usefulness remains relevant, social influence and emotional trust emerged as stronger adoption predictors in this collectivist context.

The research reveals significant demographic variations requiring segmented design strategies. Technical reliability, particularly offline functionality, requires urgent improvement. Theoretical contributions include proposing a culture-adapted TAM extension incorporating family support variables.

Future research should pursue longitudinal studies across diverse elderly care products and explore intergenerational co-design approaches. Ultimately, age-friendly technology must transcend functional performance to embrace cultural values, positioning smart devices as bridges in an aging society rather than technological barriers.

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