

## Privacy Concerns in Online Media Usage: A Comparative Study Across Gender and Age Groups

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### [Abstract]

This study investigates privacy concerns related to online media usage across gender and age groups in Korea using data from the 2022 Korea Media Panel Survey (N=9,941). Results indicate no significant gender differences in privacy awareness; however, considerable age-related variations were observed. Children aged 6-9 exhibited the lowest concern levels, while individuals in their 20s and 30s reported the highest. These findings highlight the necessity for age-specific privacy solutions. The study proposes adaptive privacy management systems and user interfaces tailored to age-related cognitive characteristics. For younger users, co-learning privacy education programs with caregivers are recommended, while for adults, tools emphasizing autonomy and customization are more suitable. These insights contribute to developing user-centered privacy-enhancing technologies (PETs) and age-aware human-machine interfaces (HMIs), offering engineering-oriented strategies for enhancing digital privacy protection.

▶ **Key words:** Privacy concerns, Online media, Digital literacy, Age-specific privacy design, Korea Media Panel Survey

### [요 약]

본 연구는 2022년 한국미디어패널조사 자료(N=9,941)를 활용하여 온라인 미디어 이용 시 프라이버시 우려 수준을 성별·연령별로 비교 분석하였다. 분석 결과, 성별 간 유의한 차이는 나타나지 않았으나 연령대별 차이는 뚜렷하게 관찰되었다. 6-9세 아동은 우려 수준이 가장 낮았고, 20-30대는 가장 높은 수준을 보였다. 이러한 결과는 연령 특성에 기반한 맞춤형 프라이버시 보호 전략의 필요성을 시사한다. 본 연구는 아동을 위한 보호자 동반형 프라이버시 교육과 성인을 위한 자율성·개인화 중심의 프라이버시 관리 도구를 제안하며, 사용자 중심의 프라이버시 강화 기술(PETs) 및 연령 인지형 인터페이스 개발에 기여할 수 있는 공학적 시사점을 제공한다.

▶ **주제어:** 프라이버시 우려, 온라인 미디어, 디지털 리터러시, 연령별 프라이버시 디자인, 한국 미디어 패널 조사

## I. Introduction

The widespread adoption of online media has fundamentally transformed how individuals communicate, consume information, and engage with digital services [1]. In South Korea, one of the most digitally connected societies worldwide, 91.8% of the population aged 3 and above had internet access in 2022 [2], with platforms such as video streaming services, social networking sites, online gaming, and digital news becoming essential components of everyday life [3]. While these technologies offer convenience and accessibility, they also raise significant concerns regarding the collection, use, and protection of personal data [1,4]. The growing dependence on digital ecosystems has heightened user exposure to privacy breaches, identity theft, and algorithmic surveillance [2], underscoring the need for user-centered privacy protection solutions that incorporate demographic and cognitive diversity [1,4].

Despite increasing privacy concerns, studies utilizing nationally representative data remain limited, especially within the Korean context. Previous research has explored factors influencing privacy awareness, including personality traits, cultural norms, and levels of digital literacy [5], with demographic characteristics such as age and gender playing significant roles in shaping privacy-related perceptions and actions [6]. However, empirical evidence on how these demographic factors shape privacy concerns in highly digitalized East Asian societies is scarce. Understanding these patterns is essential for developing adaptive privacy management systems, customizable user interfaces, and age- and gender-sensitive engineering designs that can effectively protect diverse user populations.

This study addresses this gap by analyzing data from 9,941 respondents in the 2022 Korea Media Panel Survey, providing empirical evidence on demographic variations in privacy concerns across

gender and age groups. The research aims to: (1) assess overall levels of perceived online privacy concern among Korean users; (2) examine differences in privacy concern by gender and age group; and (3) identify engineering-oriented, data-driven strategies to inform the development of privacy-enhancing technologies (PETs) and adaptive user experience (UX) designs. Cognitive and behavioural differences linked to age influence how users perceive and respond to privacy threats [7], and gender differences in digital privacy behaviours vary across cultural and technological contexts [8]. By providing precise, empirically-grounded specifications for age- and gender-responsive privacy solutions, this study contributes to designing intelligent, user-centered privacy systems and developing age-aware human-machine interfaces (HMIs), thereby advancing digital safety in engineering practice.

## II. Theoretical Background

### 2.1. Privacy Concerns in the Digital Age

Privacy concerns have become a central research focus in both academic and engineering domains [4,9]. Communication Privacy Management (CPM) Theory emphasizes that individuals use boundary rules to manage their private information [10]. Privacy Calculus Theory posits that individuals make rational decisions by weighing perceived benefits against potential risks when disclosing personal data online [11,12]. The “privacy paradox” describes the discrepancy between stated privacy concerns and actual disclosure behaviors [13,14].

### 2.2. Demographic Factors and Privacy Awareness

Age and gender are critical demographic variables influencing privacy attitudes [6,15]. Children may lack developmental capacity to comprehend digital risks [16,17], while elderly adults often struggle with privacy settings [18,19]. Gender-based patterns exist, with some studies

suggesting women express higher privacy concern [20], though findings vary across cultural contexts [8,21].

### III. Materials and Methods

#### 3.1. Research Scope and Objectives

This study examines privacy concerns among Korean online media users across demographic groups, focusing on gender and age variations to inform the development of adaptive privacy technologies.

#### 3.2. Research Design and Participants

This study conducted secondary data analysis using the 2022 Korea Media Panel Survey (KMPS), a nationally representative cross-sectional dataset [3]. The KMPS is an annual longitudinal survey conducted by the Korea Information Society Development Institute (KISDI) to monitor media usage patterns and attitudes in South Korea. The final sample comprised 9,941 respondents aged six years and older (4,938 males and 5,003 females).

#### 3.3. Korea Media Panel Survey Overview

The KMPS employs a stratified multi-stage probability sampling design to ensure national representativeness [3]. Data collection occurred between September and November 2022 through face-to-face interviews and self-administered questionnaires. The survey covers various aspects of media usage, including internet access, device ownership, online activities, and privacy concerns.

#### 3.4. Survey Instrument and Variables

Privacy concern was measured using five survey items from the 2022 KMPS dataset [3]. The dependent variable, privacy concerns, was measured using five items on a 5-point Likert scale (1 = not at all concerned, 5 = very concerned), assessing online privacy concern, concern about

forgotten information, concern about excessive data requests, suspicion toward others online, and identity theft concern. A total privacy score was calculated by summing the five items (range: 5-25), with higher scores indicating greater levels of concern. The independent variables included gender (male/female) and age group (6-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, and  $\geq 70$  years).

#### 3.5. Data Analysis

Statistical analyses were conducted using IBM SPSS Statistics (Version 28.0.1). Individual cross-sectional weights provided by the KMPS were applied to minimize nonresponse bias [3]. These weights were calculated using the Raking Ratio Method, which adjusts interim weights according to projected population distributions by region, gender, and age, based on the 2022 Population Projection Report.

Descriptive statistics were first computed, with frequencies and percentages reported for gender and age group, and means (M) and standard deviations (SD) used to summarize levels of privacy concern. To examine gender differences in privacy concerns, independent samples t-tests were conducted, and the t-statistic, degrees of freedom (df), p-value, and Cohen's d were reported. Cohen's d values were interpreted as 0.2 (small effect), 0.5 (medium effect), and 0.8 (large effect). To assess differences across age groups (6-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, and  $\geq 70$  years), one-way analysis of variance (ANOVA) was performed. When significant differences were identified, Tukey's Honestly Significant Difference (HSD) post-hoc tests were conducted to determine specific pairwise group differences. The F-statistic, p-value, and eta-squared ( $\eta^2$ ) were reported, with  $\eta^2$  interpreted as 0.01 (small effect), 0.06 (medium effect), and 0.14 (large effect). In the tables, post-hoc results are indicated using superscript letters, where groups sharing the same letter do not differ significantly ( $p > .05$ ).

Prior to conducting parametric tests, assumptions of normality and homogeneity of variance were examined. Normality was assessed using the Shapiro-Wilk test for samples smaller than 2,000 and skewness and kurtosis statistics for larger samples, while homogeneity of variance was evaluated using Levene's test. All assumptions were satisfactorily met. A significance level of  $\alpha = 0.05$  was adopted for all analyses, and effect sizes were reported to provide information on the practical significance of the findings.

### 3.6. Ethical Considerations

The dataset utilized in this research is publicly available and was collected with official approval from the National Statistics Office of Korea (Approval No. 405001). Data were obtained from the KISDI website (<http://www.kisdi.re.kr>) and are fully anonymized [2]. As the study involves secondary analysis of de-identified data, no direct interaction with human participants occurred, and informed consent was not required. All research procedures adhered to ethical standards for the use of public data and protection of personal information. The adherence to ethical guidelines ensures that privacy and confidentiality principles were maintained throughout the research process, aligning with the journal's standards for responsible engineering research.

## IV. Results

### 4.1. Characteristics of the Participants

A total of 9,941 individuals aged six years and older were included in the final analysis (Table 1). The gender distribution was nearly balanced, comprising 4,938 males (49.7%) and 5,003 females (50.3%). The participants were distributed across the following age groups: 6-9 years (1.7%), 10-19 years (9.6%), 20-29 years (13.4%), 30-39 years (13.5%), 40-49 years (16.6%), 50-59 years (17.7%), 60-69 years (14.9%), and 70 years and above

(12.3%). This relatively even distribution across gender and age cohorts provides a solid foundation for comparative analysis of perceived privacy concerns among different demographic subgroups.

Table 1. Demographic Characteristics of Korean Online Media Users Aged 6 Years and Older (N=9,941)

Variables	N (%)
Gender	
Men	4,938 (49.7)
Women	5,003 (50.3)
Total	9,941 (100.0)
Age group	
6-9	173 (1.7)
10-19	958 (9.6)
20-29	1,335 (13.4)
30-39	1,345 (13.5)
40-49	1,652 (16.6)
50-59	1,764 (17.7)
60-69	1,486 (14.9)
≥70	1,227 (12.3)
Total	9,941 (100.0)

### 4.2. Gender Differences in Privacy Concerns

Independent samples t-tests revealed no statistically significant differences between men and women across all five privacy concern items and the total privacy concern score (Table 2). All p-values exceeded .05, and effect sizes (Cohen's d) were negligible ( $< 0.2$ ), indicating that gender is not a meaningful predictor of privacy concern levels in this Korean sample. This finding suggests that privacy concerns are relatively uniform across genders in Korea's highly digitalized society, where internet access and digital literacy have converged between men and women [2,3].

### 4.3. Age Group Differences in Privacy Concerns

In contrast to the non-significant gender differences, one-way ANOVA revealed statistically significant age-related differences across all privacy concern items (Table 3). All F-statistics were large and significant ( $p < .001$ ), with effect sizes ( $\eta^2$ ) ranging from .097 to .130, indicating medium to large effects. Post-hoc analyses using Tukey's HSD test demonstrated distinct age-group

Table 2. Gender Differences in Online Privacy Concerns: Independent Samples t-test Results (N = 9,941)

Privacy Concern Item	Men (n=4,938) M ± SD	Women (n=5,003) M ± SD	t	df	p	Cohen's d
Online Privacy Concern	3.63 ± 1.1	3.64 ± 1.1	-0.28	9,939	0.597	0.01
Forgotten Information	3.59 ± 1.1	3.59 ± 1.2	-0.03	9,939	0.958	0
Excessive Data Requests	3.59 ± 1.2	3.59 ± 1.2	0	9,939	0.983	0
Suspicion toward Others	3.59 ± 1.1	3.60 ± 1.1	-0.09	9,939	0.765	0.01
Identity Theft Concern	3.57 ± 1.1	3.58 ± 1.1	-0.08	9,939	0.776	0.01
Total Privacy Score	17.97 ± 5.0	17.80 ± 5.2	0.05	9,939	0.82	0.01

Note: All  $p > .05$ ; no significant gender differences observed. Effect sizes (Cohen's  $d$ ) are negligible ( $< 0.2$ ), indicating no practical significance.

Table 3. Age Group Differences in Online Privacy Concerns: ANOVA and Tukey's HSD Post-hoc Results (N = 9,941)

Age Group	n	Online Privacy	Forgotten Info	Excessive Data	Suspicion	Identity Theft	Total Score
6-9	173	2.73±1.4 <sup>a</sup>	2.69±1.3 <sup>a</sup>	2.59±1.4 <sup>a</sup>	2.55±1.4 <sup>a</sup>	2.55±1.3 <sup>a</sup>	13.12±6.6 <sup>a</sup>
10-19	958	3.53±1.1 <sup>b</sup>	3.52±1.4 <sup>b</sup>	3.52±1.2 <sup>b</sup>	3.57±1.1 <sup>b</sup>	3.56±1.1 <sup>b</sup>	17.68±5.1 <sup>b</sup>
20-29	1,335	3.93±1.0 <sup>c</sup>	3.87±1.0 <sup>c</sup>	3.88±1.0 <sup>c</sup>	3.87±1.0 <sup>c</sup>	3.85±1.0 <sup>c</sup>	19.39±4.3 <sup>c</sup>
30-39	1,345	3.94±1.0 <sup>c</sup>	3.85±1.0 <sup>c</sup>	3.89±1.1 <sup>c</sup>	3.81±1.1 <sup>c</sup>	3.85±1.0 <sup>c</sup>	19.33±4.3 <sup>c</sup>
40-49	1,652	3.80±1.0 <sup>bc</sup>	3.80±1.0 <sup>c</sup>	3.79±1.0 <sup>c</sup>	3.80±1.0 <sup>c</sup>	3.81±1.0 <sup>c</sup>	18.98±4.2 <sup>bc</sup>
50-59	1,764	3.72±1.0 <sup>b</sup>	3.69±1.1 <sup>bc</sup>	3.66±1.1 <sup>b</sup>	3.67±1.0 <sup>b</sup>	3.63±1.0 <sup>b</sup>	18.37±4.5 <sup>b</sup>
60-69	1,486	3.45±1.1 <sup>d</sup>	3.33±1.2 <sup>d</sup>	3.35±1.2 <sup>d</sup>	3.38±1.2 <sup>d</sup>	3.36±1.2 <sup>d</sup>	16.86±5.3 <sup>b</sup>
≥ 70	1,227	2.95±1.3 <sup>e</sup>	2.90±1.3 <sup>e</sup>	2.92±1.4 <sup>e</sup>	2.96±1.4 <sup>e</sup>	2.83±1.3 <sup>e</sup>	14.55±6.3 <sup>a</sup>
F-statistic		118.88	114.03	112.14	107.16	133.48	147.93
p-value		< .001	< .001	< .001	< .001	< .001	< .001
$\eta^2$ (effect size)		0.107	0.103	0.101	0.097	0.119	0.13

Note: Values are M ± SD. Different superscript letters (a, b, c, d, e) indicate significant differences based on Tukey's HSD post-hoc tests ( $p < .05$ ). Groups sharing the same letter are not significantly different from each other. Effect sizes ( $\eta^2$ ) indicate medium to large effects (all  $> 0.06$ ).

patterns. Children aged 6-9 (superscript 'a') reported significantly lower levels of privacy concern than all other age groups (all  $p < .001$ ). Young adults aged 20-29 and 30-39 (superscript 'c') formed a homogeneous high-concern cluster, with mean total scores of approximately 19.3-19.4, which were significantly higher than those of all other groups (all  $p < .001$ ). The middle-aged groups (40-49, 50-59, and 60-69; superscripts 'b', 'bc', and 'd') exhibited intermediate and partially overlapping levels of concern. Adults aged 70 and older (superscript 'a' or 'e') showed significantly lower concern than those aged 10-69 (all  $p < .001$ ), with levels approaching those of children aged 6-9 ( $p = .156$ , not significant).

Overall, the results indicate a U-shaped relationship between age and privacy concern, with

the lowest levels observed at both ends of the age spectrum (children and adults aged 70+) and the highest levels during young adulthood (20s-30s). This non-linear pattern has important implications for the development of age-tailored privacy education and user interface design [22,23].

## V. Discussion

The absence of significant gender differences in privacy concerns contradicts some Western-derived theoretical predictions but is consistent with Korea's status as a highly digitalized society characterized by relatively high levels of digital gender equality [2,24]. In contexts where men and women have comparable access to

digital technologies and similar levels of digital literacy, gender may no longer function as a primary determinant of privacy awareness [25]. This finding suggests that in advanced digital economies, structural factors such as internet infrastructure and digital education may exert a stronger influence on privacy attitudes than traditional gender-based differences.

The observed U-shaped age pattern highlights distinct vulnerabilities across the lifespan. Children aged 6-9 exhibit minimal concern, likely due to limited cognitive development and lower levels of privacy awareness [16,17]. In contrast, young adults aged 20-39 demonstrate the highest levels of concern, which may reflect their active engagement with diverse digital platforms, greater exposure to privacy risks, and heightened awareness of data collection practices [26,27]. The decline in concern among adults aged 70 and older may be associated with lower levels of digital engagement, reduced perceived vulnerability, or cohort effects linked to pre-digital socialization experiences [18,19,28].

These findings provide important implications for the development of age-tailored privacy-enhancing technologies [29,30]. For children, simplified privacy interfaces combined with parental controls and co-learning educational programs are essential [31,32]. Young adults may benefit from granular privacy settings that support autonomy and customization [33]. Middle-aged users require balanced solutions that integrate usability with robust protection mechanisms [34], whereas older adults may need simplified configuration options, clear visual guidance, and enhanced technical support [18,35,36].

Several limitations should be acknowledged. The cross-sectional design limits causal interpretation, and self-reported privacy concerns may not accurately reflect actual privacy behaviors, a phenomenon often described as the "privacy paradox" [13,14]. Moreover, the analysis focused primarily on demographic characteristics and did not incorporate psychological, cultural, or

situational variables that may moderate privacy attitudes. Future research should adopt longitudinal designs, incorporate behavioral measures, and employ experimental approaches to clarify causal relationships. Cross-national comparative studies would further contribute to understanding cultural variations in age- and gender-related privacy patterns [37-39].

## VI. Conclusions

This study provides robust empirical evidence on demographic variations in online privacy concerns among Korean users, based on a nationally representative sample of 9,941 respondents. The findings reveal no significant gender differences but substantial age-related variations, with a U-shaped pattern characterized by low concern among children (6-9) and elderly adults (70+) and peak concern among young adults (20-39). These results have important implications for the development of adaptive, age-responsive privacy technologies and inform policy interventions aimed at protecting vulnerable populations. Future research should extend these findings through longitudinal and cross-cultural studies to advance our understanding of privacy dynamics in the digital age [40,41,42].

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