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About the Journal

Child Health Nursing Research (CHNR) is the official peer-reviewed research journal of the Korean Academy of Child Health Nursing. CHNR is a multidisciplinary, double-blind peer-reviewed, open-access journal that publishes original research, theory, and review papers on health care and nursing from the beginning of life to young adulthood, including both children and their families. It is devoted to all fields of child health, including global and cultural issues, aimed at both domestic and international healthcare professionals. The journal is published quarterly (Jan 31, Apr 30, July 31, and Oct 31) in English. The journal welcomes submissions from healthcare professionals around the world, and encourages the submission of papers dealing with cultural issues and those studied by international research teams.

- Indexed in major databases: PubMed Central, PubMed, Scopus, CINAHL, DOAJ, Crossref Metadata, Google Scholar, ScienceCentral, KCI (Korea Citation Index), RISS, KoreaMed, and KoMCI.
- Its abbreviated title is Child Health Nurs Res.
- Open access: All articles published in the journal are freely available with an open access license for everyone to read and download from the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication.

Aims and Scope

Child Health Nursing Research aims to promote the health, development, and well-being of children and their families in Korea and all over the world by providing research on evidence-based practices.
Its scope includes the most recent clinically and academically relevant topics in health care and nursing from the beginning of life to young adulthood, including both children and their families. The journal deals with articles that address research, theory, and practice in a wide range of child health nursing areas and relevant cultural issues. Its regional scope is mainly Korea, but it welcomes submissions from researchers and nurses worldwide.
The primary readers of this journal are healthcare professionals, administrators and scientists serving newborns, infants, children, adolescents, young adults, and their families, including nurses, midwives, physicians, developmental specialists, public health workers, scientists, educators, epidemiologists, and other health caregivers.
The ultimate goal of *Child Health Nursing Research* is to develop a body of knowledge on the health of newborns, infants, children, adolescents, young adults, and their families while improving the clinical field and community with evidence-based practices to promote the health of children and families all over the world.

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Pediatric nursing in the AI era: from clinical integration to ethical practice to education

Yunsoo Kim

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Artificial intelligence (AI) is rapidly emerging as a foundational technology, reorganizing the entire medical field and extending far beyond simple technological innovation. This transformation is occurring across various domains of medicine. However, pediatrics, which represents a small proportion of healthcare resources compared to other population groups [1], presents especially complex ethical and practical challenges. As AI systems become increasingly embedded in areas such as clinical decision support, diagnosis, disease prediction, and personalized treatment, pediatric nursing must play a central role in integrating these new technologies into practice and reflecting on their ethical implications. In this editorial, we examine the expanding role of AI in pediatric nursing practice, its anticipated benefits, and critical considerations that must not be overlooked, drawing on recent research findings and ongoing ethical discussions.

1. AI-Based Clinical Decision Support System (AI-SDSS) and the Role of Pediatric Nurses

Clinical decision support systems (CDSS) based on machine learning have the potential to improve early disease detection and identify risk groups in pediatric care. Notably, AI-CDSS have demonstrated promising performance, achieving high specificity and low false-positive rates compared to conventional rule-based models in diagnosing severe pediatric diseases such as sepsis, traumatic brain injury, and pneumonia [2]. These systems can provide real-time alerts in clinical settings, recommend evidence-based interventions, and help reduce the cognitive burden on healthcare providers. For example, a randomized controlled study showed that pediatric asthma management using AI-CDSS led to improved efficiency in clinic time and cost savings, without adversely affecting clinical outcomes [3].

However, the value of these systems extends beyond simple performance metrics. To provide meaningful clinical support, models must be interpretable and seamlessly integrate into clinical workflows, ultimately aligning with clinicians' professional judgment. Pediatric nurses serve in multiple roles as emergency responders, care coordinators, and family communicators. They are uniquely positioned to accurately interpret and apply recommendations from AI systems in clinical practice. Therefore, understanding and using AI (i.e., AI literacy) should be considered an essential component of future pediatric nursing competencies.

2. Redefining the Practical Role of Pediatric Nurses in the AI-Driven Digital Health Age

Traditionally, pediatric medicine has focused on diagnosing and treating acute illnesses. However, the field has shifted toward an integrated model that emphasizes the holistic

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health and well-being of children. AI is now recognized as a key driver accelerating this change. Indrio et al. [4] introduced the integration of AI into the "7P model" of pediatric medicine. This model emphasizes a prediction-centered approach, strengthens family engagement, and promotes multidisciplinary collaboration to address complex health needs through a personalized, predictive, preventive, participatory, precise, and multi-professional framework.

AI enables early prediction of diseases such as autism spectrum disorder, neonatal sepsis, and childhood obesity by analyzing diverse data sources, including genetic information, developmental assessments, and social determinants of health. Pediatric nurses can serve as key mediators who interpret predictive data, implement preventive interventions tailored to the child and family's circumstances, and coordinate care that is culturally responsive.

In particular, the rise of AI-integrated digital health technologies, such as wearable devices, presents significant opportunities at the intersection of nursing and AI. For children with chronic conditions like asthma or type 1 diabetes, AI-powered wearables can monitor their health in real time at home. Nurses play a crucial role in teaching families how to use these devices, recognizing warning signs, and managing virtual follow-ups. Additionally, in areas with limited healthcare resources or restricted access due to geography, AI-based telehealth technologies can help improve the continuity and equity of pediatric care.

3. Ethical Applications of AI in Pediatric Nursing and the Role of Nurses

Despite significant technological progress, the widespread adoption of AI in pediatric care depends on building caregivers' trust and meeting ethical obligations. Berghea et al. [5] conducted a cross-sectional study among Romanian parents to evaluate attitudes toward the use of AI in their children's healthcare. While overall acceptance was high, substantial differences emerged based on educational level. Caregivers with lower educational attainment were more likely to resist AI-based decision-making, primarily due to concerns about technological errors and a perceived disconnect from medical staff. Nearly 89% of all respondents indicated that human supervision was necessary, and over 90% required prior consent and clear explanations before AI implementation. These findings underscore a fundamental ethical tension in pediatric care: balancing the efficiency of technology, trust rooted in human relationships, and respect for caregivers' autonomy. Unlike adults, children cannot make fully informed decisions, and caregivers may lack professional understanding of the limitations or reasoning behind AI systems. Therefore, pediatric nurses should play a key role in providing transparent information, fostering shared decision-making, and ensuring robust ethical safeguards with caregivers when integrating AI into treatment plans.

Additionally, the impact of AI on equity and justice in healthcare should not be overlooked. Several studies have raised concerns that algorithmic bias may worsen existing health disparities. For example, some urinary tract infection prediction models have underestimated disease prevalence in Black children, and differences in the sensitivity of sepsis diagnosis across racial groups have been reported [2]. Nursing leadership should critically assess the cultural appropriateness and fairness of AI tools, and actively promote the collection and use of complete and representative data to ensure their effectiveness.

4. Nursing Education in the AI Era: Integrating Practical Competence and Ethical Sensitivity

Research on AI is expanding rapidly, yet there remain few examples of its integration into real-world pediatric nursing interventions. Many AI models are developed in academic or resource-rich environments, which can limit their effectiveness when applied to diverse populations or varied clinical settings. The absence of standardized data systems, clinician skepticism, and insufficient systematic education on AI capabilities further widen the gap between development and practical application. Pediatric nurses are therefore required to adopt a dual role: not only as early adopters of AI technology but also as advocates for child-centered ethical innovation.

As key mediators who bridge AI analysis with the health needs of children and families, nurses are crucial in translating complex predictive information into actionable healthcare plans. They can also enhance the real-world relevance of AI by providing feedback to developers about usability, intuitiveness, and the integration of these tools into clinical workflows. In this regard, nurses must not only act as end users of technology but also as co-designers of AI solutions within interdisciplinary collaborative teams.

To carry out these roles effectively, digital health and AI-related competencies should be incorporated into pediat-

ric nursing curricula. This education must go beyond basic technical proficiency to include the critical evaluation of AI-based tools, ethical judgment and accountability, and effective communication strategies with guardians and children about responsible technology use. Just as infection control became a core component of nursing education after the COVID-19 (coronavirus disease 2019) pandemic, understanding and applying algorithms should now be established as a central focus in nursing education for the AI era.

5. From Support to Collaboration: AI's Role as a Companion in Human-Centered Nursing

As pediatric care undergoes a transformative shift, it is more important than ever to regard AI not merely as a technical tool but as a strategic partner in providing human-centered, evidence-based care. AI holds significant potential to augment nurses' vigilance, enable personalized care, and enhance care coordination. However, this potential can only be fully realized when AI is used thoughtfully and ethically, grounded in the principles of transparency, accountability, and empathy.

Today, pediatric nursing stands at a critical crossroads. The integration of AI should not replace the core values of relationship-centered nursing but should instead expand its scope and depth through predictive insights, preventive strategies, and personalized support. As nurses have long safeguarded the dignity and well-being of their patients, the profession must now take the lead in guiding the use of AI technologies—ensuring they serve the best interests of children and families.

ARTICLE INFORMATION

Authors' contribution

All the work was done by Yunsoo Kim.

Conflict of interest

Yunsoo Kim has been the editor-in-chief of *Child Health Nursing Research* since 2022. She was not involved in the review process of this editorial. No existing or potential conflict of interest relevant to this article was reported.

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ORIGINAL ARTICLE

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Association between smartphone overdependence and sexual behavior in adolescents: a secondary data analysis of the 19th Youth Health Behavior Survey

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Purpose: The majority of adolescents use smartphones, and their overdependence on smartphones has emerged as a serious social issue. Although studies have explored the effect of smartphone overdependence on adolescent problem behaviors, research on its influence on sexual behavior is scarce. This study aimed to examine the association between smartphone overdependence and sexual behavior among adolescents.
Methods: This study used data from the 19th Korea Youth Risk Behavior Web-Based Survey conducted in 2023. Smartphone overdependence was the independent variable, and sexual behaviors (sexual intercourse and contraceptive use) were the dependent variables. Multivariate regression analysis was performed to control for confounding variables.
Results: The study participants included 52,880 adolescents aged 13–18 years. Among them, 28.0% (n=14,672) were classified as smartphone overdependent, 6.5% (n=3,349) had sexual experience, and 65% (n=2,182) of those with sexual experience reported using contraception. Smartphone overdependence was not significantly associated with sexual experience but was significantly associated with contraceptive use. Adolescents in the non-overdependent group were 1.27 times more likely to use contraception than those in the smartphone overdependent group (95% confidence interval, 1.07–1.52; p<.007).
Conclusion: The findings highlight a significant association between smartphone overdependence and contraceptive use among adolescents. Policy interventions and educational strategies that consider adolescents' smartphone usage patterns and trait factors are necessary.

Keywords: Adolescent; Korea; Secondary data analysis; Sexual behavior; Smartphone

INTRODUCTION

The introduction of the first-generation iPhone in 2007 signaled the onset of the smartphone era, and since then, smartphone use has rapidly increased across the globe. As of 2023, 69.4% of the world's population uses a smartphone [1], and 94.8% of South Korea's population uses a smartphone [2]. Consistent with this trend, smartphone penetration among teenagers has grown rapidly, with 95% of teenagers in both the United States and South Korea now owning a mobile device. Smartphone ownership among teenagers worldwide is nearly universal [2].

Smartphones are equipped with various convenient features that enable activities such as communication, information searching, entertainment, healthcare management, and financial transactions. They are also characterized by their

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ability to provide users with unrestricted access to attractive content at any time, leading to addiction problems, such as smartphone overdependence [2,3]. In South Korea, the percentage of smartphone dependence steadily increased until 2021, reaching 24.2%, and it decreased slightly to 23.1% in 2023. However, adolescents have the highest rate compared with that of other age groups, at 40.1% in 2023, and this rate is still rising [3].

South Korean adolescents are reported to use smartphones primarily to watch video content and play games, spending the most time per day using smartphones compared with other age groups [2,3]. Video and game content accessible on smartphones often contains harmful and problematic elements, which may be associated with problematic behaviors in young people [4]. Sexual content is a common form of harmful material to which adolescents are often exposed. Statistics on the mediums through which youth encounter sexualized material show that internet searches and ads, YouTube, social media, and chat apps accessible on smartphones top the list [5]. With the rapid advancement of smartphones and internet technology, communication through various media has become widespread, increasing adolescents' exposure to sexual content. This exposure can increase sexual curiosity and potentially lead to sexual encounters [6]. Additionally, adolescents who use social media—primarily through smartphones—are reported to be more than twice as likely to engage in risky sexual behaviors, such as not using contraception during intercourse, than those who do not use social media [7].

Adolescence is a period of increased sexual urges and curiosity, and unprotected sexual activity during this period can lead to sexually transmitted infections (STIs), pregnancy, and miscarriage [8]. Although the rate of sexual intercourse among adolescents in the United States is higher than that in other developed countries, it has been steadily declining, from 45.7% in the early 2000s to 38.4% in 2019 [8]. In contrast, the prevalence of sexual intercourse among South Korean adolescents is low in absolute terms—5.1% in 2006 and 6.5% in 2023—but is increasing [9,10]. Most pregnant adolescents experience health challenges and disruptions to their education, social life, and economic stability, which affects the teenagers themselves as well as their families and communities [11].

With the rates of sexual activity among adolescents on the rise, contraception is an important issue. Contraception is a cost-effective and safe way of preventing the negative effects of sexual intercourse among adolescents in terms of personal health and social outcomes [8]. Sexual and reproductive health behaviors formed during adolescence are crucial because they lay the foundation for health behaviors in adulthood [12]. The prevalence of contraceptive use among South Korean adolescents increased from 39.1% in 2006 to 77.3% in 2023 [9,10]. However, this remains lower than the 98.9% contraceptive prevalence rate among the US adolescents in 2019 [8]. Consequently, in South Korea, continued attention and targeted interventions are necessary to promote adolescent sexual health and improve contraceptive use considering the increasing prevalence of sexual activity among youth.

Therefore, this study aimed to examine whether differences exist in actual sexual behaviors between adolescents with high levels of smartphone use—characterized as smartphone overdependence—and those without such dependence. To this end, data from the 19th Korea Youth Risk Behavior Survey (KYRBS) [10], a large-scale cross-sectional survey of middle and high school students, were used to analyze the association between smartphone overdependence and sexual behaviors (i.e., sexual intercourse experience and contraceptive use). The specific objectives of this study were to examine whether sexual behaviors among Korean adolescents differ based on their level of smartphone dependence and to investigate the influence of smartphone dependence on these sexual behaviors.

METHODS

Ethical statements: This study was a secondary analysis of existing data and did not require institutional review board approval or informed consent.

1. Study Design

In this study, we conducted a secondary analysis of raw data from the 19th KYRBWS to investigate the association between smartphone overdependence and sexual behavior among adolescents [10]. The reporting of this study adhered to the guidelines outlined in Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) initiative [13].

2. Study Setting and Sample

The KYRBS is an annual government-approved statistical survey (approval number: 117058) conducted jointly by the Ministry of Education, Ministry of Health and Welfare, and Korea Disease Control and Prevention Agency to assess the health status of Korean adolescents [10]. The survey is conducted using an anonymous self-administered online questionnaire. In 2023, 52,880 middle and high school students from 799 schools (399 middle schools and 400 high schools) participated in the survey, achieving a participation rate of 92.9% based on the student population. Students with long-term absences, those unable to participate independently due to special needs, and students with literacy disabilities were excluded from the study population. Data collection occurred from August to October 2023. Students individually accessed the survey system on their mobile devices using a participation code printed on the survey instruction while in classrooms with internet access. Furthermore, KYRBWS employs a complex sampling design, and the dataset includes weights to account for selection probability, response rates, and population composition.

3. Variables and Measurements

1) General characteristics

In this study, general characteristics were selected through a literature review to analyze factors associated with sexual behavior among adolescents. A previous study using data from the KYRBWS identified factors influencing sexual experience among middle school students, including school type, grade level, smoking experience, alcohol use, drug use, economic status, average weekly allowance, and cohabitation with family [15]. Based on these findings, this study included the following variables as general characteristics: gender, school type, subjective academic performance, subjective economic status, cohabitation with family, experience of sex education at school, lifetime smoking experience, lifetime alcohol use, and lifetime drug use.

2) Smartphone overdepence

The smartphone overdependence instrument consists of a 10-item self-reported questionnaire measured on a 4-point Likert scale [14]. The total score ranges from a minimum of 10 to a maximum of 40, with higher scores indicating greater levels of smartphone overdependence. Based on the total score, participants can be categorized into three groups: normal group (10–22 points), potential risk group (23–30 points), and high-risk group (31–40 points). In this study, the potential risk and high-risk groups were combined into a single risk group (23–40 points) and compared with the normal group (10–22 points).

3) Sexual behavior

Sexual behavior was assessed using questions about sexual intercourse experiences and contraceptive use. Sexual intercourse experiences were determined by asking the following question: "Have you ever had sexual intercourse?" The use of contraception was assessed among participants with sexual experience by asking the following question: "Did you use contraception to prevent pregnancy during sexual intercourse?" Participants who responded "always" or "most of the time" were categorized as the contraceptive use group, whereas those who responded "occasionally" or "never" were categorized as the non-contraceptive use group.

4. Data Analysis

Data analysis was performed using IBM SPSS Statistics software ver. 26.0 (IBM Corp.). For complex sample data analysis, we used the stratification, clusters, and weights information provided in the KYRBWS raw data guidelines [10]. Descriptive statistical analysis was performed to examine the general characteristics of the adolescents included in the survey. All chi-square tests were used to identify differences in sexual experience and contraceptive use based on smartphone overdependence. Multivariate logistic regression analysis was performed to examine the association between smartphone overdependence and sexual behaviors among adolescents. To ensure accuracy, general characteristics showing statistically significant differences based on sexual intercourse experience and contraceptive use were included as covariates in the analysis.

RESULTS

1. General Characteristics of the Study Population

The general characteristics of the study population revealed that 51.5% (n=26,769) were male and 50.9% (n=28,401) were middle school students. Regarding subjective academic performance, 29.4% (n=15,540) rated their performance as "av-

erage." In addition, 44.8% (n=23,981) of respondents rated their subjective economic status as "average." A total of 95.9% (n=50,362) of the participants reported living with their families, and 72.1% (n=38,527) reported having received sex education at school. Most participants reported no history of smoking, alcohol use, or drug use in their lifetime, with proportions of 89.8% (n=47,525), 67.4% (n=35,604), and 98.3% (n=52,041), respectively. Regarding levels of smartphone overdependence, 72.0% (n=38,208) were categorized as the normal group, whereas 28.0% (n=14,672) were classified as the risk group (Table 1).

2. Sexual Intercourse and Contraceptive Use by Smartphone Overdependence and General Characteristics

Sexual intercourse and contraceptive use were analyzed according to the general characteristics of the study participants (Table 2). Among the participants (n=52,880), 6.5% (n=3,349) reported having had sexual experience, and contraceptive use was assessed for these 3,349 participants. Sexual experience showed statistically significant differences according to gender, school type, subjective academic performance, subjective economic status, cohabitation with family, experience of sex education at school, lifetime smoking experience, lifetime alcohol use, and lifetime drug use. Contraceptive use showed statistically significant differences across all variables except for gender, including school type, subjective academic performance, subjective economic status, cohabitation with family, experience of sex education at school, lifetime smoking experience, lifetime alcohol use, and lifetime drug use. Additionally, when analyzing differences in sexual experience and contraceptive use based on smartphone overdependence, all variables showed significant differences according to smartphone overdependence (Table 2).

3. Association of Smartphone Overdependence with Adolescents' Sexual Behavior

1) Sexual intercourse

A logistic regression analysis was conducted to examine the association between smartphone overdependence and

Table 1. General characteristics of the study population

Variable	Category	No. (%)[a]
Sex	Male	26,769 (51.5)
	Female	26,111 (48.5)
School type	High school	24,479 (49.1)
	Middle school	28,401 (50.9)
Perceived academic performance[b]	High	6,795 (12.9)
	Middle-high	13,246 (25.2)
	Middle	15,540 (29.4)
	Middle-low	12,377 (23.3)
	Low	4,917 (9.2)
Perceived economic status[b],[c]	High	6,284 (12.3)
	Middle-high	16,126 (31.1)
	Middle	23,981 (44.8)
	Middle-low	5,434 (9.8)
	Low	1,050 (1.9)
Co-residence with family members[b]	Yes	50,362 (95.9)
	No	2,511 (4.1)
Sex education experience	Yes	38,527 (72.1)
	No	14,353 (27.9)
Lifetime smoking experience	Yes	5,355 (10.2)
	No	47,525 (89.8)
Lifetime drinking experience	Yes	17,276 (32.6)
	No	35,604 (67.4)
Lifetime drug use	Yes	839 (1.7)
	No	52,041 (98.3)
Smartphone overdependence	Normal group	38,208 (72.0)
	Risk group	14,672 (28.0)

[a]Unweighted frequency and weighted percentage. [b]Missing data were not included. [c]Percentages may not total 100 due to rounding.

Table 2. Comparison of sexual intercourse and contraceptive use based on sample characteristics

Variable	Sexual intercourse (n=52,880)			Use of contraception (n=3,349)		
	Yes (n=3,349)	No (n=49,531)	χ^2 (*p*)	Yes (n=2,182)	No (n=1,167)	χ^2 (*p*)
Sex			92.27 (<.001)			0.30 (.584)
Male	2,018 (62.2)	24,751 (50.8)		1,314 (61.8)	704 (62.9)	
Female	1,331 (37.8)	24,780 (49.2)		868 (38.2)	463 (37.1)	
School type			623.67 (<.001)			87.53 (<.001)
High school	2,455 (75.6)	22,024 (47.3)		1,720 (80.9)	735 (65.2)	
Middle school	894 (24.4)	27,507 (52.7)		462 (19.1)	432 (34.8)	
Perceived academic performance[a)]			72.47 (<.001)			3.12 (.015)
High	371 (10.9)	6,424 (13.1)		223 (10.2)	148 (12.4)	
Middle-high	669 (19.8)	12,577 (25.6)		447 (19.6)	222 (20.3)	
Middle	878 (26.5)	14,662 (29.6)		587 (27.5)	291 (24.2)	
Middle-low	840 (25.1)	11,537 (23.2)		566 (26.2)	274 (23.0)	
Low	591 (17.7)	4,326 (8.5)		359 (16.5)	232 (20.1)	
Perceived economic status[a)]			82.59 (<.001)			9.48 (<.001)
High	472 (14.4)	5,812 (12.2)		272 (13.0)	200 (17.2)	
Middle-high	885 (26.9)	15,241 (31.4)		612 (28.6)	273 (23.7)	
Middle	1,329 (39.4)	22,652 (45.2)		895 (40.6)	434 (37.0)	
Middle-low	469 (13.5)	4,965 (9.6)		308 (13.6)	161 (13.2)	
Low	194 (5.8)	856 (1.6)		95 (4.2)	99 (8.9)	
Co-residence with family members[a)]			241.18 (<.001)			12.35 (<.001)
Yes	2,936 (89.2)	47,426 (96.4)		1,942 (90.8)	994 (86.3)	
No	412 (10.8)	2,099 (3.6)		240 (9.2)	172 (13.7)	
Sex education experience			78.66 (<.001)			5.83 (.016)
Yes	2,193 (64.6)	36,334 (72.6)		1,465 (66.3)	728 (61.4)	
No	1,156 (35.4)	13,197 (27.4)		717 (33.7)	439 (38.6)	
Lifetime smoking experience			4,570.40 (<.001)			4.86 (.028)
Yes	1,661 (49.3)	3,694 (7.4)		1,052 (47.8)	609 (52.3)	
No	1,688 (50.7)	45,837 (92.6)		1,130 (52.2)	558 (47.7)	
Lifetime drinking experience			1,860.64 (<.001)			9.91 (.002)
Yes	2,445 (72.5)	14,831 (29.8)		1,639 (74.5)	806 (68.7)	
No	904 (27.5)	34,700 (70.2)		543 (25.5)	361 (31.3)	
Lifetime drug use			573.92 (<.001)			14.86 (<.001)
Yes	251 (7.3)	588 (1.3)		130 (5.9)	121 (10.1)	
No	3,098 (92.7)	48,943 (98.7)		2,052 (94.1)	1,046 (89.9)	
Smartphone overdependence			8.04 (.005)			12.03 (<.001)
Normal group	2,317 (69.5)	35,891 (72.2)		1,566 (71.6)	751 (65.2)	
Risk group	1,032 (30.5)	13,640 (27.8)		616 (28.4)	416 (34.8)	

Values are presented as unweighted frequency (weighted %), unless otherwise stated.
[a)]Missing data were not included.

sexual intercourse experience among adolescents. As presented in Table 2, nine general characteristics expected to affect sexual intercourse were included as covariates. The results showed that smartphone overdependence was not significantly associated with sexual intercourse experience (odds ratio [OR], 0.97; 95% confidence interval [CI], 0.87–1.07; $p=.529$). The overall model was statistically significant (Wald $\chi^2=3,653.42$, degrees of freedom [df]=15.31, $p<.001$) (Table 3).

Regarding the covariates, males were significantly less likely than females to have experienced sexual intercourse (OR, 0.86; 95% CI, 0.78–0.94; $p=.001$). High school students had significantly lower odds of sexual intercourse compared to middle school students (OR, 0.42; 95% CI, 0.38–0.46; $p<.001$). Lower perceived economic status was associated with higher odds of sexual intercourse; in particular, the "low" group showed significantly higher odds compared to the "high" group (OR, 1.29; 95% CI, 1.00–1.66; $p=.049$). In addition, co-residence with family members and lifetime experiences of smoking, drinking, and drug use were significantly associated with sexual intercourse experience (Table 3).

Table 3. Association between smartphone overdependence and sexual intercourse and contraceptive use among adolescents

Independent variable	Category	Dependent variable			
		Sexual intercourse[a] (n=52,880)		Use of contraception[a] (n=3,349)	
		OR (95% CI)	*p*	OR (95% CI)	*p*
Smartphone overdependence	Risk group (Ref: normal group)	0.97 (0.87–1.07)	.529	0.77 (0.65–0.92)	.004
Sex	Male (Ref: female)	0.86 (0.78–0.94)	.001	1.10 (0.93–1.30)	.269
School type	High school (Ref: middle school)	0.42 (0.38–0.46)	<.001	0.45 (0.38–0.54)	<.001
Perceived academic performance	(Ref: high)				
	Middle-high	0.87 (0.75–1.02)	.082	0.92 (0.68–1.25)	.599
	Middle	0.82 (0.70–0.96)	.011	1.02 (0.75–1.38)	.913
	Middle-low	0.88 (0.76–1.03)	.120	1.04 (0.75–1.43)	.818
	Low	1.14 (0.97–1.36)	.119	0.88 (0.64–1.23)	.456
Perceived economic status	(Ref. high)				
	Middle-high	0.71 (0.62–0.83)	<.001	1.40 (1.05–1.86)	.021
	Middle	0.63 (0.55–0.72)	<.001	1.20 (0.93–1.56)	.170
	Middle-low	0.81 (0.68–0.96)	.015	1.17 (0.85–1.60)	.346
	Low	1.29 (1.00–1.66)	.049	0.64 (0.44–0.94)	.022
Co-residence with family members	No (Ref: yes)	0.60 (0.51–0.71)	<.001	1.34 (1.03–1.74)	.032
Sex education experience	No (Ref: yes)	0.97 (0.89–1.06)	.491	1.30 (1.09–1.55)	.004
Lifetime smoking experience	Yes (Ref: no)	0.18 (0.16–0.19)	<.001	1.30 (1.09–1.56)	.004
Lifetime drinking experience	Yes (Ref: no)	0.37 (0.33–0.41)	<.001	0.74 (0.60–0.94)	.004
Lifetime drug use	Yes (Ref: no)	0.40 (0.32–0.50)	<.001	1.25 (0.90–1.72)	.181
Wald χ^2		3653.42		137.54	
df (*p*)		15.31 (<.001)		15.26 (<.001)	

OR, odds ratio; CI, confidence interval; Ref, reference group; df, degrees of freedom.
[a]The data were adjusted for sex, school type, perceived academic performance, perceived economic status, co-residence with family members, sex education experience, lifetime smoking experience, lifetime alcohol use, and lifetime drug use.

2) Use of contraception

A logistic regression analysis was conducted to examine the association between smartphone overdependence and contraceptive use among adolescents who had experienced sexual intercourse. As presented in Table 2, nine general characteristics expected to affect contraceptive use were included as covariates. The results showed that adolescents in the smartphone overdependence group were significantly less likely to use contraception compared to those in the normal group (OR, 0.77; 95% CI, 0.65–0.92; $p=.004$). The overall regression model was statistically significant (Wald $\chi^2=137.54$, df=15.26, $p<.001$) (Table 3).

Regarding the covariates, high school students were significantly less likely than middle school students to use contraception (OR, 0.45; 95% CI, 0.38–0.54; $p<.001$). Adolescents in the lowest economic group were significantly less likely to use contraception than those in the highest group (OR, 0.64; 95% CI, 0.44–0.94; $p=.022$). Additionally, co-residence with family members, sex education experience, and lifetime experiences of smoking and drug use were significantly associated with contraceptive use (Table 3).

DISCUSSION

In this study, we examined the sexual behavior of smartphone-dependent adolescents and analyzed the effect of smartphone dependence on sexual behavior. Using representative data from the 19th KYRBS [10], we found that smartphone dependence among adolescents was associated with contraceptive use.

Adolescents who were more dependent on their smartphones were less likely to use contraception than those who were not. Smartphone-dependent adolescents may have fewer opportunities to engage in conversations about contraception. According to the social control theory, social bonds among adolescents are critical in deterring delinquent behavior [16]. Parents, teachers, and peers are key sources of social support for adolescents [17]. In addition, smartphone overdependence is more common among adolescents who receive less support from parents or peers [18,19]. These findings indicate that adolescents with smartphone overdependence may experience a lack of parental warmth, supervision, rational guidance, and close friendships [18]. Parent–child communication and peer counseling have protective effects on contraceptive use [20,21]. Considering these findings,

adolescents who are overdependent on smartphones may have lower rates of contraceptive use due to limited communication with parents and peers about contraception. In South Korea, only 16.2% of adolescents reported having discussed sex with others, indicating a very low level of sexual communication [5]. These statistics highlight the need for efforts to improve contraceptive behaviors through enhanced communication between parents and adolescents and among peers. Because smartphone-dependent adolescents often lack adequate social support, it is necessary to provide them with opportunities or platforms to discuss topics such as contraception.

A review of previous studies on factors influencing smartphone overdependence and contraceptive use indicates that certain adolescent traits have been identified as factors. Traits such as depression, impulsivity, self-regulation, and self-esteem influence smartphone overdependence and contraceptive behavior [3,19,22-25]. Although >80% of youth in South Korea receive education on healthy smartphone use and sexual health [26], adolescents often cannot translate this knowledge into action [10], indicating that interventions should focus on education as well as identifying and addressing underlying trait factors.

The lower likelihood of contraceptive use among adolescents who are overdependent on smartphones may be influenced by their exposure to harmful content. The 19th KYRBS data analyzed in this study does not include specific details on the contents adolescents are exposed to on their smartphones, making it difficult to draw definitive conclusions [10]. However, it is necessary to analyze the association considering that adolescents who are overdependent on smartphones primarily consume video content on these devices, that videos constitute the most common form of sexualized media encountered by adolescents, and that the main channels through which such content is accessed—such as internet searches, advertisements, social media, and YouTube—are readily available via smartphones [2,3,5]. A previous study reported that exposure to sexual content among adolescents is associated with an increased likelihood of engaging in unprotected sex [27]. Thus, it is necessary to examine whether exposure to sexualized content mediates the relationship between smartphone overdependence and contraceptive behavior to draw clearer conclusions. Additionally, studies should examine the differences in content quality accessed by smartphone-dependent and non-dependent adolescents and analyze how this affects their sexual behavior.

Our study found no association between smartphone dependence and rates of sexual intercourse. Adolescents who use social media tend to have a strong need for interpersonal connections, whereas those who play games have a higher need for avoidance [28]. In this regard, smartphone-dependent adolescents in South Korea predominantly use video content and games [2,3], indicating a higher tendency toward avoidance. Sex is more than just a physical act; it is associated with basic human needs for emotional connection and social support [29]. Therefore, the high avoidance tendencies observed among smartphone-dependent youth in Korea are likely not associated with the rate of sexual experience. The model of the initiation of sexual activity indicates that both biological and psychosocial factors influence the initiation of sexual activity [30]. Biological factors include the development of physical abilities and sexual motivation related to hormones, whereas psychosocial factors encompass cultural influences (such as regional differences, religion, school, and media), family, and peers that shape individual decisions. Culture, which includes media, also plays a role in influencing the initiation of sexual behavior. However, in the modern world, both smartphone- and non-smartphone-using teenagers have access to sexual information, making it unlikely that smartphone dependence alone will lead to significant differences in sexual experiences. The results of this study indicate that emphasis should be placed on the nature of smartphone use rather than merely the amount of time spent on smartphones. Therefore, future studies should analyze differences in sexual behavior based on smartphone usage characteristics. Additionally, other psychosocial factors outlined in the sexual initiation model may be key; thus, the rate of sexual experience should also be examined in terms of factors such as culture (e.g., education in school and social norms), home environment, and friendships.

Because of the nature of the data analyzed in this study, we could not perform an in-depth analysis of adolescents' actual smartphone usage content or frequency of sexual intercourse. Moreover, the cross-sectional design limits the ability to determine causal relationships. Nevertheless, the significance of this study lies in its being the first to examine the association between smartphone overdependence and sexual behavior using nationally representative data from the 19th KYRBS.

CONCLUSION

In this study, we aimed to examine the association between

smartphone overdependence and sexual behavior among adolescents using nationally representative panel data. This study is significant because it represents the first attempt to explore the effect of smartphone overdependence on sexual behavior within the broader context of recent efforts to understand the association between smartphone use and problematic behaviors among adolescents. The analysis revealed that smartphone overdependence was not associated with sexual intercourse. However, among adolescents who had experienced sexual intercourse, those classified as overdependent on smartphones reported lower rates of contraceptive use than their non-overdependent peers. Given that inadequate contraceptive use among adolescents can increase the risk of unintended pregnancies and STIs, this study highlights the need for early and targeted interventions. For adolescents who are overdependent on smartphones, it is important to promote communication with parents and peers about sexual topics and to identify psychological vulnerabilities to deliver integrated interventions that address both mental and sexual health. In addition, efforts should be made to incorporate digital media education and information literacy into existing sex education programs for this population.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: BRL, JHL. Formal analysis: BRL, JHL. Writing–original draft: BRL, JHL. Writing–review and editing: BRL, JHL. Final approval of the published version: BRL, JHL.

Conflict of interest

Bo Ryeong Lee has been an editor of *Child Health Nursing Research* since 2024. She was not involved in the review process of this article. No existing or potential conflict of interest relevant to this article was reported.

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Data availability

Please contact the corresponding author for data availability.

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Eye health behaviors and parental influencing factors among preschool children in Korea: a cross-sectional study

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Purpose: This study explored the threat and efficacy factors influencing children's eye health behaviors using an Extended Parallel Process Model for parents of preschool children.
Methods: Data were collected from October 30 to November 6, 2023, using a web-based survey. In total, 166 parents of preschool children participated in this cross-sectional study. Data were analyzed using Pearson's correlation coefficients and multiple regression analyses. Parents' eye health knowledge, eye health threat factors (perceived severity and susceptibility), and eye health efficacy factors (self-efficacy and response efficacy) related to preschoolers were measured. Eye health behavior was assessed by observing the children's behavior over the past week.
Results: The eye health behaviors of preschool children were positively correlated with their parents' eye health knowledge (r=.21, p=.006), perceived severity (r=.22, p=.004), response efficacy (r=.36, p<.001), and self-efficacy (r=.64, p<.001). Children's eye health behavior showed a negative correlation with perceived susceptibility (r=-.27, p<.001). As seen on multiple regression analysis, the factor influencing children's eye health behavior was self-efficacy (β=.57, p<.001), and the model's explanatory power was approximately 43% (F=24.09, p<.001).
Conclusion: To promote eye health behavior in preschool children, it is necessary to strengthen the self-efficacy of parents. The results of this study can be used to develop eye health programs for preschool children and their parents.

Keywords: Eye; Health behavior; Preschool child; Self-efficacy

INTRODUCTION

There are approximately 19 million children with vision impairment worldwide, eye health problems in children are an important issue, as they can cause numerous problems in adulthood [1]. In South Korea, 645,488 children aged 0–9 years were diagnosed with refractive and accommodative disorders in 2021, making them the second most prevalent group after children aged 10–19 years [2], and the prevalence increased as they entered school (4.8% compared to 2019) [3]. This suggests that if eye health interventions are not actively implemented during the preschool years, more serious eye problems may arise as children reach school age. Since the COVID-19 (coronavirus disease 2019) pandemic, preschool children have been spending more time indoors, which has increased their screen time: TV, computers, and smartphones [4]. Time spent using electronic devices, viewing posture, viewing distance from screens, unbalanced diets, and time spent outdoors are factors that affect the eye health of preschool children [5].

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The preschool years are a critical period for vision development [6] and an opportune time to form eye health habits that can have lifelong implications [7]. Children's vision reaches adult levels around the age of 5 to 6 years [8], if normal vision development does not occur till then, it can cause more serious problems later in childhood, resulting in irreversible vision loss [9]. Poor vision in the preschool years can lead to poor concentration and learning difficulties, which can significantly impact growth and development in subsequent years [6].

Because of preschoolers' language and cognitive development, they understand simple concepts and have a partial understanding of cause and effect, which allows them to avoid behaviors labeled dangerous. Therefore, as long as parents warn their children about behaviors that threaten eye health and encourage them to engage in eye health-promoting behaviors, they can lead to positive changes in preschoolers' eye health behaviors. Since parents significantly influence children [10] and smartphone and electronic device use primarily occurs at home, it can be said that parents have a significant impact on children's eye health behaviors.

Parents' knowledge and perception of eye health are important factors influencing children's eye health behaviors [11]. When parents have misinformation about children's eye health, children's eye health problems can be overlooked [12]. In addition, parents' perceptions of threat factors, such as prolonged media viewing and risk perception of eye problem symptoms, affect children's screen time and eye care behaviors [13]. One factor that directly influences children's health behaviors is parental self-efficacy. Self-efficacy is an individual's belief in their ability to successfully accomplish a task in a particular situation [14]. Previous studies have shown that higher levels of self-efficacy in parents are associated with healthier behaviors in their children [15].

Existing studies on children's eye health have mainly focused on parents' knowledge and perceptions regarding eye screening examinations or relevance to screen time exposure [16]. However, these studies often lack an integrated analysis that incorporates child behavior change and psychological factors such as self-efficacy and threat perception. The Extended Parallel Process Model (EPPM) by Witte [17] offers a comprehensive framework that accounts for both cognitive and psychological factors influencing health-related behaviors. This model predicts individual attitudes or behavioral responses to health messages based on two key components: perceived threat and efficacy [18]. Although EPPM was initially applied to feared disease prevention efforts, such as acquired immunodeficiency syndrome [19], its use has recently expanded to health promotion contexts, such as encouraging dental visits [20] and breast cancer prevention [21]. For instance, Askelson et al. [20] applied the EPPM to identify factors for parents' decisions to seek preventive dental care for their children, concluding that the model is well-suited to understanding parental motivations in early childhood health decisions. Given its broad applicability, the EPPM provides a valuable theoretical framework for examining how parents influence eye health behaviors in preschool children. Moreover, it enables the exploration of how perceived threat and efficacy among parents shape actions related to their children's eye health.

Witte and Allen [19] found that behavioral change occurs when individuals respond to fear messages with a high perceived threat and high efficacy of recommended behavior. Applying the EPPM to this study, when parents have high threat perception and high efficacy in response to messages about their children's eye health, they recognize the threat and engage in active threat-control behaviors. However, if they have a low threat perception or low efficacy, they may not acknowledge the threat and take no action, or they may feel fearful but ignore their health concerns. This study was conducted to examine parents' perceived threat and efficacy levels regarding their children's eye health and to explore how these factors influence children's eye health behaviors (Figure 1).

This study is the second step of the "Study on the development and effectiveness of eye health promotion programs for preschool children," and the questionnaire was constructed based on the primary research, which is a literature review and focus group interview study [22]. The EPPM by Witte [17] was used as the theoretical framework to examine the effects of parents' perceived threats and efficacy on children's eye health behaviors. The results will be used as a basis for developing a parental education intervention to promote eye health behaviors in preschool children.

This study was conducted among parents of preschool children to identify factors influencing eye health behaviors. The objectives of this study were: (1) To compare differences in eye health behaviors of preschool children according to parents' and children's general characteristics; (2) To identify the relationships among parents' eye health knowledge, perceived threats, perceived efficacy, and preschool children's eye health behaviors; and (3) To identify the effects of par-

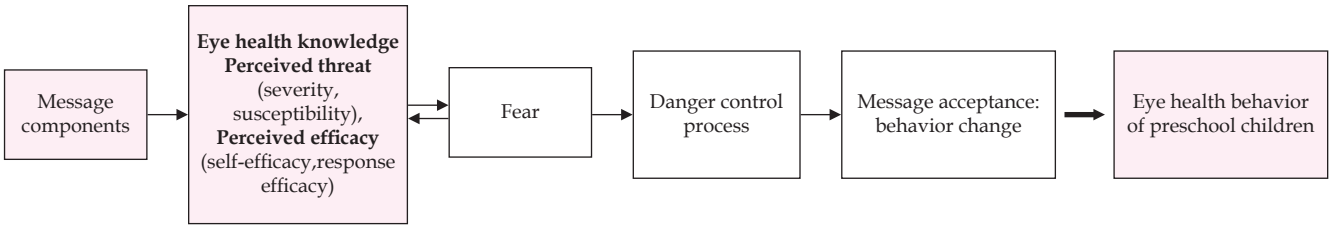

Figure 1. Theoretical framework.

ents' eye health knowledge, perceived threat, and perceived efficacy on preschool children's eye health behaviors.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of a Woosong university (IRB No., 1041549-231010-SB-176). Informed consent was obtained from all participants.

1. Study Design

This descriptive survey study aimed to identify factors influencing preschool children's eye health behaviors. This study followed the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [23].

2. Theoretical Framework

The theoretical framework of this study is the EPPM of Witte [17], which is measured by including variables related to preschool children's eye health.

According to this model, an individual exposed to messages first evaluates the seriousness of the threat. If the individual perceives the threat as significant, they are more likely to seek or process additional information about it. This threat recognition can lead to fear, which then prompts the individual to evaluate their own efficacy in responding to the threat [17]. Based on this efficacy assessment, if the individual recognizes that they possess sufficient efficacy to avoid threats, they engage in the threat control process. Finally, they accept the message and change their behavior [17].

EPPM incorporates both cognitive and emotional factors, such as fear, and recognizes that information provision may be part of the message component [24]. Therefore, in this study, eye health knowledge was measured as a message component to determine whether parents were aware of the symptoms and management of children's eye health. Perceived threat comprises perceived severity and susceptibility. Perceived severity is an individual's perception of the extent of harm when the negative consequences of a threat occur, and perceived susceptibility is the perception of the likelihood of encountering issues [17]. In this study, the perceived severity measured how seriously parents were aware of children's eye health hazards. Perceived susceptibility was measured how sensitive parents are to the occurrence of eye health problems in their children. Perceived efficacy comprises self-efficacy and response efficacy. Self-efficacy refers to individual's belief in their capability to engage in behaviors to prevent threats, whereas response efficacy refers to individual's perception of the usefulness of behaviors [17]. In this study, the self-efficacy was measured by the parents' belief that they could discipline children to engage in eye health behavior. Response efficacy was measured by parents' belief that disciplining children to engage in eye health behavior is beneficial to eye health. Behavioral changes measured changes in children's eye health behaviors (Figure 1).

3. Study Setting and Sample

The participants in this study were parents raising children aged 3 to 6 years who were able to read and write Korean and are agreed to participate in an online survey. The study was conducted as a web survey using an online questionnaire. The number of participants was calculated using G*power ver. 3.1.9.2 (Heinrich-Heine-Universität Düsseldorf) with a significance level of $\alpha = .05$, medium effect size of .15, and power $(1-\beta) = .80$, based on prior studies that used regression analysis [25], resulting in a number of 146 participants. Considering a dropout rate of 10%, 163 parents were recruited as study participants.

4. Measurement Tools

The measurement tools were selected in consultation with a professor of pediatric nursing and reviewed by a PhD (Doctor of Philosophy) in child nursing to ensure the appropriateness of their wording and content. Moreover, the original English instruments were translated into Korean by the author and another researcher. To ensure semantic equivalence, the Korean versions were back-translated by international nursing students fluent in both English and Korean.

1) Eye health knowledge

Eye health knowledge was measured using a tool developed by Shin and Oh [26] for eye health in elementary school students and modified to be relevant to preschool children. A sample question is as follows: "What kind of glasses do you wear when your eyes are nearsighted?" Each correct response scored 1 point, whereas an incorrect response scored 0 points. The tool comprises 10 items on eye structure and abnormalities, six items on vision development and care, and nine items on vision protection and eye infection prevention, totaling 25 items. A higher score indicates a greater level of knowledge. The Cronbach's α was 0.77 in the study by Shin and Oh [26], and it was 0.63 in this study.

2) Perceived threat

(1) Perceived severity

Perceived severity was measured by modifying three items concerning perceived severity using the Eye Health Beliefs tool by Liu et al. [27]. Perceived severity measured the extent to which respondents agreed with statements such as "I think it is a serious problem for children to develop myopia early due to the frequent use of electronic devices (smartphones, TV tablets, and other electronic devices)." Each item is scored on a 5-point scale ranging from strongly disagree to strongly agree, with higher scores indicating greater perceived severity. The Cronbach's α was 0.86 in the study by Liu et al. [27] and 0.90 in this study.

(2) Perceived susceptibility

Perceived susceptibility was measured by modifying the 'eye health problem' tool by Shin and Oh [26]. It consists of 12 items, including options such as "My child is irritable because of eye discomfort." Each item was scored on a scale from 1 (strongly disagree) to 4 (agree), with higher scores indicating more frequent recognition of eye abnormality symptoms by the child. Cronbach's α was 0.87 in the study by Shin and Oh [26] and 0.92 in this study.

3) Perceived efficacy

(1) Self-efficacy

Self-efficacy was measured by modifying the Eye Health Self-Efficacy tool by Liu et al. [27]. The tool comprises 11 items, including "I can ensure that my child maintains an appropriate distance when using electronic devices. A five-point scale ranging from strongly disagree (1) to strongly agree (5) was used for each statement. Higher scores indicated higher self-efficacy in eye health behaviors. The Cronbach's α was 0.83 in the study by Liu et al. [27] and 0.87 in this study.

(2) Response efficacy

The perceived benefit item was modified from the Eye Health Beliefs tool by Liu et al. [27]. It consists of six items, such as, "I believe that limiting my child's use of electronic devices to 1 hour or less per day will help my child's vision management." This was measured according to the degree of agreement with each item on a scale of 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher response efficacy. The Cronbach's α was 0.86 in the study by Liu et al. [27] and 0.83 in this study.

4) Eye health behavior

Parents assessed eye health behaviors by observing the preschool children's eye health behaviors during the previous week. The behaviors were measured using the modified Eye Health Behavior tool by Lee et al. [5]. This tool comprises questions such as "When I look at my smartphone, I look at it from a distance of more than 30 centimeters." It includes 18 questions on lifestyle activities that support eye health, eye care, eye infections, and trauma prevention. Each question is evaluated on a 4-point Likert-type scale (1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree). Higher scores indicate better eye health behaviors. The Cronbach's α was 0.76 in the study by Lee et al. [5] and 0.80 in this study.

5. Data Collection

The survey was conducted by a professional research company and conducted using a web-based online survey from October 30th to November 6th in 2023. Participants were recruited through an online announcement distributed to the

company's nationwide panel. Only those who provided consent to participate in the study at the beginning of the online questionnaire were surveyed. The time required to complete the questionnaire was approximately 15 to 20 minutes.

An explanation of the study was provided at the beginning of the online questionnaire given to the participants, including the purpose of the study, confidentiality, autonomy, and the possibility of withdrawal, and how personal information would be managed. Only those who indicated their consent to participate in the study began the survey. The explanation stated that even if the participants consented to participate in the study, they could stop and withdraw at any time they wish.

6. Data Analysis

The collecting data were analyzed using IBM SPSS/WIN ver. 24.0 (IBM Corp.). The general characteristics of the participants were analyzed using real numbers and percentages. Differences in eye health behaviors based on general characteristics were analyzed using an independent t-test with analysis of variance, and post-hoc tests were conducted using the Scheffé test. The eye health knowledge, perceived severity, perceived susceptibility, self-efficacy, response efficacy, and eye health behaviors of preschool children's parents were analyzed using means and standard deviations. The correlation between each variable was calculated using Pearson's correlation coefficient. Multiple regression analysis was used to analyze the factors influencing the participants' eye health behaviors.

RESULTS

1. General Characteristics and Differences in Eye Health Behaviors

The participants in this study were parents with children aged 3–6 years, comprising 89 female (53.6%) and 77 male (46.4%) parents. The mean age of the parents was 39.39±4.63 years, and the majority of parents had a college degree or higher (95.8%). The usage status of eyeglasses was 76 (45.8%) for fathers and 78 (47.0%) for mothers. Among the children, 85 were girls (51.2%) and 81 were boys (48.8%), with 11 children wearing eyeglasses (6.6%). The number of children who had undergone eye examination was 106 (63.9%). Not all the differences in eye health behaviors based on the general characteristics of parents and children were statistically significant (Table 1).

Children spent the most time on electronics on the weekdays, with 68 children (41.0%) spending 1–2 hours per day, while 61 (36.8%) spent more than 2 hours per day. Three hours or more was the most common, with 64 children (38.6%) during weekends. While viewing their smartphones, 88 children (53.0%) held their device in an upright position on a table, 62 (37.3%) held it in their hands, and 16 (9.6%) viewed it while lying down. When looking at a smartphone, the distance between the eyes and the smartphone was between 15 and 30 centimeters, with 108 participants (65.1%) reporting this distance and 39 (23.5%) reporting more than 30 centimeters (Table 1).

2. Correlation between Eye Health Knowledge, Perceived Threat, Perceived Efficacy, and Eye Health Behaviors

The mean score of the participants' eye health knowledge was 16.62±2.67, with 66.48% correct answers. The mean scores for perceived severity were 13.52±1.87, perceived susceptibility was 21.66±7.02, self-efficacy was 40.80±6.74, response efficacy was 26.19±3.32, and eye health behaviors were 54.36±6.38 (Table 2).

Eye health behaviors were positively correlated with eye health knowledge ($r=.21$, $p=.006$) and perceived severity ($r=.22$, $p=.004$), respectively. Additionally, they were positively correlated with self-efficacy ($r=.64$, $p<.001$) and response efficacy ($r=.36$, $p<.001$), respectively. Eye health behaviors were negatively correlated with perceived susceptibility ($r=-.27$, $p<.001$) (Table 3).

3. Factors Influencing Eye Health Behaviors in Preschool Children

A multiple regression analysis was conducted using the variables of parents' eye health knowledge, perceived severity, perceived susceptibility, response efficacy, and self-efficacy as factors influencing eye health behaviors. As a result of the Shapiro-Wilk test of major variables-eye health knowledge, self-efficacy, and eye health behaviors-showed normality at the significance level of .05. Additionally, Mardia's test for multivariate normality indicated that the assumption of multivariate normality was satisfied. The tolerance limits ranged from .48 to .93, which is greater than 0.1 when multi-

Table 1. General characteristics and differences in eye health behaviors (N=166)

Characteristic	No. (%)	Eye health behavior	
		Mean±SD	t or F (*p*)
Parent (n=166)			
Sex			1.58 (.117)
Female	89 (53.6)	55.08±6.52	
Male	77 (46.4)	53.52±6.15	
Age (yr)			0.63 (.535)
30–39	86 (51.8)	54.78±5.95	
40–49	75 (45.2)	53.77±6.87	
≥50	5 (3.0)	55.80±6.26	
Education level			0.95 (.438)
High school	7 (4.2)	51.14±5.43	
College	27 (16.3)	53.41±6.05	
University (<3 yr)	9 (5.4)	52.89±5.56	
University (<4 yr)	96 (57.8)	54.72±6.33	
Graduate	27 (16.3)	55.33±7.29	
Wearing glasses			
Father			0.32 (.752)
Yes	76 (45.8)	54.18±6.73	
No	90 (54.2)	54.50±6.10	
Mother			0.32 (.747)
Yes	78 (47.0)	54.53±6.88	
No	88 (53.0)	54.20±5.93	
Child (n=166)			
Sex			0.66 (.509)
Female	85 (51.2)	54.04±6.43	
Male	81 (48.8)	54.69±6.35	
Age (yr)			1.15 (.332)
3	44 (26.5)	54.39(6.00)	
4	42 (25.3)	53.43(5.58)	
5	42 (25.3)	55.81(7.58)	
6	38 (22.9)	53.74(6.13)	
Wearing glasses			1.52 (.131)
Yes	11 (6.6)	51.55±7.47	
No	155 (93.4)	54.55±6.27	
Experience of eye exam			1.20 (.20)
Yes	106 (63.9)	54.80±6.89	
No	60 (36.1)	53.57±5.32	
Hours watching electro device (hr)			
Week days		1.46±0.92	1.58 (.196)
<1	37 (22.3)	56.08±6.17	
1–<2	68 (41.0)	54.43±6.13	
2–<3	37 (22.3)	53.05±6.28	
≥3	24 (14.5)	53.50±7.27	
Weekend		2.41±1.39	3.69 (.013)* a,b,c>d
<1[a]	17 (10.2)	57.00±5.98	
1–<2[b]	35 (21.1)	55.89±5.50	
2–<3[c]	50 (30.1)	54.76±6.45	
≥3[d]	64 (38.6)	52.50±6.48	
Posture when looking smartphone			16.97 (<.001)** a>b,c
Sitting with it on the table[a]	88 (53.0)	56.75±6.01	
Sitting with it in one's hand[b]	62 (37.3)	52.18±5.77	
Lying position[c]	16 (9.6)	49.63±5.06	
Distance between eye & smartphone (cm)			6.56 (.002)** a,b>c
<15[a]	19 (11.4)	51.68±6.68	
15–<30[b]	108 (65.1)	53.78±5.97	
≥30[c]	39 (23.5)	57.26±6.48	

SD, standard deviation.
*p<.05. **p<.01.

Table 2. Descriptive statistic for eye health knowledge, perceived threat & efficacy, and eye health behavior (N=166)

Variable	Mean±SD (correct answer rate %)	Min–max	Possible range
Eye health knowledge	16.62±2.67 (66.48)	9–23	0–25
Perceived threat			
Perceived severity	13.52±1.87	7–15	3–15
Perceived susceptibility	21.66±7.02	12–40	12–60
Perceived efficacy			
Self-efficacy	40.80±6.74	23–55	11–55
Response efficacy	26.19±3.32	17–30	6–30
Eye health behavior	54.36±6.38	40–71	18–72

SD, standard deviation.

Table 3. Correlations between eye health knowledge, perceived threat & efficacy, and eye health behavior (N=166)

Variable	Eye health knowledge	Perceived severity	Perceived susceptibility	Self-efficacy	Response efficacy	Eye health behavior
Eye health knowledge	1					
Perceived severity	0.17 (.026)	1				
Perceived susceptibility	–0.13 (.108)	–0.18 (.017)	1			
Self-efficacy	0.16 (.042)	0.30 (<.001)	–0.32 (<.001)	1		
Response efficacy	0.24 (.002)	0.68 (<.001)	–0.18 (.019)	0.43 (<.001)	1	
Eye health behavior	0.21 (.006)	0.22 (.004)	–0.27 (<.001)	0.64 (<.001)	0.36 (<.001)	1

Values are presented as r (*p*).

Table 4. Multiple regression on eye health behavior (N=166)

Variable	B	SE	β	t	*p*	VIF
Eye health knowledge	0.23	0.15	0.10	1.54	.125	1.070
Perceived severity	–0.17	0.28	–0.05	–0.61	.543	1.852
Perceived susceptibility	–0.06	0.06	–0.07	–1.03	.306	1.130
Self-efficacy	0.54	0.07	0.57	8.27	<.001	1.328
Response efficacy	0.21	0.17	0.11	1.28	.204	2.101

R^2=.43, adjusted R^2=.41, F=24.09, *p*<.001.
B, unstandardized estimate; β, standardized estimate; SE, standard error; VIF, variance inflation factor.

collinearity among the independent variables was checked, and the variance inflation factor ranged from 1.07 to 2.10, which is not greater than 10; therefore, no multicollinearity issues were found. The multiple linear regression analysis showed that self-efficacy (β=.57, *p*<.001) was the factor that influencing eye health behavior, and the model had an explanatory power of approximately 43% (F=24.09, *p*<.001) (Table 4).

DISCUSSION

The duration and frequency of smartphone and tablet use among children have increased in recent years, leading to several eye health problems. Eye health problems in children are an important health issue because they can negatively affect a child's growth and development and are preventable. Therefore, this study aimed to examine parents' knowledge, threats, and perceived efficacy of eye health in relation to preschool children, and determine their impact on preschoolers' eye health behaviors.

The main results are: the average weekday screen time for children was 1.46 hours per day. The largest group (41%) of children had 1–2 hours of screen time per day. However, 36.8% of the children exceeded 2 hours of screen time daily. Screen time was even higher on weekends than weekdays, with an average of 2.41 hours per day, and 38.6% of children spent over 3 hours a day, which is becoming increasingly concerning. This exceeds the American Academy of Pediatrics' recommendation of 2 hours of screen time [28], suggesting that active interventions are needed to reduce screen time among Korean children. Furthermore, 46.9% of Korean children used their smartphones in a posture that is either handheld, head down, or lying down. Poor posture while looking at a smartphone increases the risk of musculoskeletal disor-

ders [29] and increases the risk of myopia owing to difficulty in maintaining the appropriate distance between the smartphone and the eyes [30]. Even a distance between the smartphone and eye is recommended at least 30 cm [31]. However, the majority, 65.1%, view their smartphone at a distance of 15–30 centimeters. Only 23.5% maintained a distance of more than 30 centimeters. Prolonged smartphone viewing at close range can increase eye strain and cause myopia [30]. This study is significant because it identifies the current eye health behaviors of preschool children in Korea and suggests the need for active interventions to establish good eye health habits from preschool age.

There were no statistically significant differences in eye health behaviors based on the general characteristics of preschoolers. In a study of children aged under 2 years, Goh et al. [10] found differences in screen viewing based on the child's age and mother's education. The higher the child's age and the lower the mother's education level, the longer the child's screen time and the more electronic devices used in the study. In a study of preschool children, Määttä et al. [32] found that children's screen time varied based on parents' education level. The children in this study were 3–6 years old. In contrast, a study by Goh et al. [10] found that 90% of children aged 18–24 months already spend an average of 1.5 hours per day viewing screens. This study was conducted among children aged 3–6 years, and since children over the age of 3 are already familiar with using smartphones and tablets [4], it is unlikely that there is a significant difference with increasing age. In addition, because the parents' education levels were very high, with 95% of parents having at least a college degree in this study, there were no differences based on parents' education.

Preschool children's eye health behaviors were positively associated with parents' eye health knowledge, perceived severity, perceived efficacy, and response efficacy. Parents' eye health knowledge is a major factor that influences children's eye health behaviors. Goh et al. [10] also found that higher parental knowledge of screen-viewing recommendations was associated with shorter screen time and improved eye health behaviors in children. When parents lack knowledge about children's eye health, they may overlook eye health problems or take inappropriate actions [12]. As preschool years are a critical time for vision development [6], it is crucial for parents to gain knowledge to ensure their children's healthy development.

Parents' perceived severity is also a factor associated with their children's eye health behaviors. The higher the risk perception that parents have about the harmfulness of their child's eye health risk factors, the more they promote eye health behaviors in children through active interventions. Moreover, perceived efficacy is a key factor that directly influences behavioral change. In a study of fifth-grade children and their parents, Chang et al. [13] reported that higher parental risk perception and self-efficacy for children's eye health were associated with less screen time and higher levels of eye care behavior. Parents with high self-efficacy set rules and limits on when and how their children use electronics to guide them to engage in eye health behaviors [33]. In particular, promoting eye health behaviors in children during the preschool years is necessary for parents to control their children's inappropriate behaviors and guide them toward desirable behaviors [34]. Response efficacy is the perception of how eye health behaviors are beneficial in preventing eye health problems and provide motivation to change behavior [17]. Parents with higher perceived severity and response efficacy are more active in their children's eye care and report higher rates of eye care visits [12].

However, children's eye health behaviors were negatively correlated with their parents' perceived susceptibility. Parents' perceived susceptibility is believed to promote parents' eye health behaviors, such as early detection of eye health abnormalities in children, prompting them to seek eye examinations and treatment [12]. This study examined children's eye health behaviors but not parents' eye health behaviors, and perceived susceptibility was measured based on parents' perceptions of their children's eye-related symptoms. Therefore, children with lower eye health behaviors may have higher perceived susceptibility because their parents observed their child's behavior, such as 'rubbing eyes often,' more frequently. In addition, it is possible that children's eye health conditions make it difficult for them to engage in healthy behaviors such as looking away from electronics.

Future research should replicate this study while including additional variables, such as the presence of eye diseases in children and parental eye health behaviors.

As a result of the regression analysis, that parents' self-efficacy was identified as the predisposing factor that directly influenced eye health behaviors in preschool children, with a model explanatory power of 43%. Parental self-efficacy is a key factor that influences preschool children and is strongly associated with healthy growth, development, and physical health outcomes [15]. However, parental knowledge, per-

ceived severity, and response efficacy were not statistically significant antecedents of their children's eye health behaviors. To elicit positive eye health behaviors in children requires the ability to discipline them to control misbehavior and elicit positive behaviors [34]. While parents may have knowledge of eye health, perception of threats, and perception that eye health behaviors are useful, this may not result in the desired behavior change in their children.

Askelson at al. [35] classified parents of preschool children enrolled in Medicaid into four types based on the EPPM, according to whether the threat and efficacy factors were high and low. Among these groups, parents with low threat and high efficacy, high threat and high efficacy were 2.5 times more likely to ensure preventive dental visits compared to those who did not [35]. They concluded that parental efficacy was the most critical factor influencing the preventive care of children, which aligns with the findings of this study. Other research grounded in the EPPM framework has identified parental' perceptions of their children's dental issue severity and their own self-efficacy as key antecedents for deciding to seek preventive dental care [20]. In the current study, most preschool children were healthy and did not exhibit sufficient eye health concerns to warrant medical visits. As such, parents' perceived severity, perceived susceptibility, and response efficacy regarding eye health problems were relatively low and likely did not significantly influence their children's behavioral changes.

Jago et al. [34] stated that parental control is essential for promoting eye health behaviors in preschool children and that higher parental self-efficacy is associated with improved eye health behaviors in preschool children. Therefore, the development of strategies to increase parents' self-efficacy would be useful in limiting eye health behaviors, especially screen time, in preschool children. In the future, parent intervention programs that comprehensively address children's screen time and posture while using electronics, dietary habits, and eye trauma prevention are needed to improve parents' self-efficacy.

This study is significant in that it applied the EPPM as a theoretical framework to improve the eye health behavior of preschool children. Moreover, it demonstrated that parental perception can be categorized into threat and efficacy components. This theory, previously used mainly in the context of adult-centered, fear-inducing diseases, has now proven to be applicable in the field of child health promotion. In addition, while previous studies examined localized eye health behaviors, such as eye examinations or screen time, as dependent variables, this study differs from previous studies in that it measured the eye health behaviors of preschool children, including screen time, posture while using electronic devices, dietary habits, and prevention of eye trauma, as dependent variables. The results of this study can be used as a basis for developing intervention programs for parents to promote eye health behaviors among preschool children.

This study had a few limitations. This study did not measure changes in parental behavior, and the study design made it difficult to identify contextual relationships between the independent variables. In addition, this study has limitations in terms of external validity and representativeness of the sample. Participants were recruited through convenience sampling via an online survey platform, which may not reflect the broader population. It is necessary to elaborate on the study design in the future and examine the contextual relationships between independent variables.

CONCLUSION

This study identified the parental factors that affect eye health behaviors in preschool children based on the EPPM by Witte [17]. The factor influencing eye health behaviors in preschool children was parental self-efficacy. In the future, in order to promote the eye health behaviors of preschool children, interventions that can enhance parents' efficacy factors are needed, and EPPM can be used as a theoretical basis for intervention development. Potential approaches include encouraging early screening for children's eye health, educating parents about risk factors, and national campaigns promoting healthy eye care habits. Also, it is necessary to develop parental intervention programs, including methods to guide children's practical eye health behavior. This study could be used as basic data for the development of children's eye health intervention programs.

ARTICLE INFORMATION

Authors' contribution

All the work was done by Il Tae Park.

Conflict of interest

No existing or potential conflict of interest relevant to this

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Data availability

Please contact the corresponding author for data availability.

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Gender differences in the associations among adolescent problem behaviors: a secondary data analysis of the 2023 Korea Youth Risk Behavior Survey

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Purpose: This study aimed to investigate the association among various adolescent problem behaviors in South Korea, focusing on gender differences.
Methods: This secondary analysis was conducted using cross-sectional data from the 19th Korea Youth Risk Behavior Survey, conducted in 2023 which included 52,880 middle and high school students in South Korea. They completed an anonymous self-administered survey regarding problem behaviors (drinking alcohol, smoking, drugs use, and sexual experiences). Data were analyzed using complex-samples chi-square and multiple logistic regression models.
Results: Among the 52,880 adolescents, the prevalence rates of alcohol use, smoking, drug use, and sexual experiences were 32.6%, 8.6%, 1.7%, and 6.5%, respectively. Gender differences were observed in alcohol use complex-samples multiple logistic regression models. However, no significant gender difference was found in drug use (p=.250). Four problem behaviors were significantly associated with one other when analyzed as independent variables (odds ratio [OR], 1.33–10.85). The strongest associations were found between alcohol use and smoking (OR, 10.49–10.85), and between smoking and sexual experiences (OR, 4.91–4.96).
Conclusion: This study found significant gender differences in adolescent problem behaviors, with male adolescents exhibiting higher rates of alcohol use, smoking, and sexual experience. Strong associations were observed between alcohol use and smoking, as well as between smoking and sexual experience. These findings suggest the need for integrated intervention strategies that target multiple co-occurring problem behaviors.

Keywords: Adolescent; Drinking; Oral substance abuse; Sexual behavior; Smoking

INTRODUCTION

Adolescents tend to engage in independent actions and thinking as they move away from protective factors, such as family and school. However, because of their psychological immaturity, they frequently experience anxiety and conflicts [1]. Consequently, problem behaviors are commonly observed during adolescence; however, in most cases, these behaviors decrease or stabilize with age [2]. Steiner et al. [3] reported that the absence of protective factors during adolescence increases the risk of engaging in health-risk behaviors in adulthood by 48%–66%. In other words, the benefits of appropriate interventions during adolescence can extend into adulthood, providing long-term protective effects against various health-related outcomes, fostering the potential for health promotion [3], and playing a crucial role in maintain-

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ing physical and mental wellbeing. Problem behaviors in adolescence typically surge at the onset of puberty (around ages 12–13 years) and tend to decline around the age of 17 years. Therefore, continuous efforts toward early intervention are essential [4].

Adolescent problem behaviors involve actions that violate social norms and are externally manifested, such as drinking alcohol, smoking, drug use, and sexual behavior. These behaviors are categorized as status offenses, which refer to norm-violating actions that are inappropriate for adolescent's age and social status [4,5]. Notably, smoking and drinking alcohol harm health and frequently co-occur with other problem behaviors; in particular, they are closely linked to early sexual experiences [6]. In South Korea, habitual substance use among adolescents has increased in recent years [7]. According to national statistics, consultations related to smoking, drinking alcohol, substance abuse, and sexual behavior at Youth Counseling and Welfare Centers have increased year on year [7,8]. According to a report by the Ministry of Gender Equality and Family [8], the number of Youth Counseling and Welfare Center consultations related to smoking, drinking alcohol, and substance abuse has increased by approximately 9.3%. In addition, consultations regarding sexual behavior showed an upward annual trend.

This study was conceptually grounded in problem behavior theory (PBT), which explains adolescents' propensity to engage in norm-violating behavior. Originally developed to account for problem behaviors, this theory has been extended to include health-related behaviors [9]. PBT defines problem behaviors such as drinking alcohol, smoking, substance use, and sexual experiences. These are also the focus of this study. This theory comprises three interrelated systems of variables: the perceived environment system, the personality system, and the behavior system [10]. Notably, engagement in one problem behavior increases the likelihood of engaging in others. Although PBT includes all three systems, this study specifically focused on the behavior system. This allowed the study to examine how observable problem behaviors—drinking alcohol, smoking, substance use, and sexual experience—are interrelated among adolescents. These four behaviors were selected based on their theoretical classifications as problem behaviors, shared risk contexts, and their public health relevance, particularly for the Korean adolescent population.

During adolescence, various problem behaviors are likely to be interconnected [11,12]. Within peer relationships, certain problem behaviors can increase the likelihood of other problem behaviors occurring [13]. Therefore, this study aimed to systematically understand the characteristics of adolescent problem behaviors by examining how these four major problem behaviors are interrelated. Using this approach, this study aimed to provide fundamental data for the development of effective interventions and prevention strategies.

Adolescence is a period marked by significant physical, psychological, and social changes during which various problem behaviors may emerge [14]. Previous studies have analyzed the causes of specific behaviors and their influencing factors [15,16]. However, the interconnections among different problem behaviors have not been sufficiently explored. This is crucial for understanding adolescents' current health statuses and for establishing habits that promote long-term health. Therefore, developing effective intervention strategies is essential.

Given that adolescent problem behaviors can differ by gender, analyzing gender-based differences is essential for the development of effective interventions [2,17]. According to previous studies on gender differences, female students exhibit more pronounced internalizing symptoms than male students and are more likely to experience emotional problems, such as depression and anxiety [18]. They also tend to respond more sensitively to conflicts in interpersonal relationships and stressful events involving other people [19].

Conversely, externalizing problem behaviors are more frequently reported among male adolescents, who are more likely to exhibit behavioral issues such as aggression and antisocial behavior [18]. Despite this, few studies have directly examined gender-based differences in co-occurring problem behaviors, especially in large-scale population-based samples. Consequently, gender-related differences in problem behavior types, their mechanisms, and their interrelationships among adolescents remain unclear. A comprehensive analysis is necessary to address this gap, considering both the interconnections among key problem behaviors and the moderating role of gender.

Therefore, this study aimed to (1) analyze the interrelationships among four major adolescent problem behaviors—alcohol use, smoking, drug use, and sexual experiences—using data from the Korea Youth Risk Behavior Survey (KYRBS), and (2) examine whether these interrelationships differ according to gender.

METHODS

Ethical statements: This study was a secondary analysis of existing data and did not require institutional review board approval or informed consent.

1. Study Design

This study is a secondary data analysis using raw data from the 19th KYRBS conducted in 2023 by the Korea Disease Control and Prevention Agency (KDCA) to identify gender differences in adolescent problem behaviors and examine the associations among them [20]. Reporting followed the guidelines outlined in Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [21].

2. Study Participants

The KYRBS is an anonymous, self-administered online survey conducted annually by the KDCA. The target population comprises middle and high-school students who are enrolled in schools in South Korea in April of each year. This study analyzed data from 52,880 adolescents who participated in the 2023 survey.

3. Measurement Tools

1) General characteristics

General characteristics, such as age, school type, living arrangements, academic performance, economic status, stress levels, sleep satisfaction, anxiety, smartphone overdependence, suicidal ideation, depression, and school violence experiences were used as control variables in accordance with the results of previous studies [15,16,22]. Participants' school types were categorized as middle or high school. Living arrangements were classified as living with or without family. Academic performance, economic status, stress levels, and sleep satisfaction were categorized into the following five levels: "highest," "upper-middle," "middle," "lower-middle," and "lowest." Suicidal ideation, depression, and school violence experiences were categorized as present or absent.

Anxiety was assessed using the seven-item Generalized Anxiety Disorder Scale (GAD-7). Participants responded to the question, "Over the past two weeks, how often have you been bothered by the following problems?" on a four-point Likert scale ranging from "not at all" (0 points) to "nearly every day" (3 points) across seven items. The total score ranged from 0 to 21, with higher scores indicating severe anxiety. A score of 10 or above was classified as anxiety. Cronbach's α for this scale was 0.91 in a previous study [23] as well as in this study.

Smartphone overdependence was measured using the Smartphone overdependence scale, which consists of ten items that assess daily smartphone use on a 4-point Likert scale from "not at all" (1 point) to "very much so" (4 points). The total score ranges from 10 to 40, with higher scores indicating greater smartphone overdependence. A score of 23 or higher indicated smartphone overdependence. The Cronbach's α was 0.84 at the time of scale development [24] and 0.91 in this study.

2) Problem behaviors

(1) Alcohol use experience

Alcohol use was determined based on participants' responses to the question, "Have you ever had at least one drink in your lifetime?" Participants who responded "yes" were categorized as having alcohol use experience.

(2) Smoking experience

Participants who responded "yes" to the question, "Have you ever smoked at least one or two puffs of a regular cigarette (cigarette roll)?" were categorized as having smoking experience.

(3) Drug use experience

Participants who responded "yes" to the question, "Have you ever intentionally or habitually used drugs (such as tranquilizers, stimulants, sleeping pills, appetite suppressants or narcotic painkillers) or inhaled substances, such as glue (adhesives), marijuana, cocaine, or butane gas?" were categorized as having drug use experience.

(4) Sexual experience

Participants who responded "yes" to the question, "Have you ever had sexual intercourse?" were categorized as having had sexual experiences.

4. Data Collection

The KYRBS, a national survey conducted annually by the KDCA, was conducted with the approval of Statistics Korea

and the relevant Institutional Review Board. Data were collected through an anonymous, self-administered online survey completed by the target students. The raw data for this study were obtained from the KDCA website after receiving approval for data usage in accordance with the Agency's procedures.

5. Data Analysis

The KYRBS data were analyzed using a complex-samples design. A complex-samples design file was applied by incorporating the stratification, clustering, weighting, and finite population correction coefficients provided in the raw dataset. The analysis was performed using IBM SPSS Statistics ver. 29.0 (IBM Corp.). The participants' general characteristics and their problem behaviors were examined using complex sample descriptive statistics. Gender differences in problem behaviors and their interrelationships were analyzed using complex-sample cross-tabulation analysis. Additionally, a complex-sample logistic regression analysis was performed to identify factors influencing problem behaviors. Given the cross-sectional nature of the dataset, this analysis was exploratory, describing the associations among adolescent problem behaviors rather than determining causal relationships. Each behavior (alcohol use, smoking drug use, and sexual experiences) was examined as a dependent variable in a separate model. Other problem behaviors were included as covariates to investigate co-occurrence patterns.

RESULTS

1. General Characteristics

The participants' general characteristics are presented in Table 1. The average age was 15.17 years, and participants were comprised of 49.1% high-school students and 50.9% middle-school students. Regarding living arrangements, 95.9% lived with family. Perceived academic performance and economic status were reported as middle by 29.4% and 44.8% of the participants, respectively. Perceived stress was

Table 1. General characteristics in Korean adolescents (N=52,880)

Characteristic	Category	Value
Age (yr)		15.17±0.023
School type	High school	24,479 (49.1)
	Middle school	28,401 (50.9)
Living arrangement (n=52,873)	With family	50,362 (95.9)
	Without family	2,511 (4.1)
Perceived academic performance (n=52,875)	High	20,041 (38.1)
	Middle	15,540 (29.4)
	Low	17,294 (32.5)
Perceived economic status (n=52,875)	High	22,410 (43.5)
	Middle	23,981 (44.8)
	Low	6,484 (11.7)
Perceived stress	High	19,699 (37.3)
	Moderate	23,874 (45.3)
	Low	9,307 (17.4)
Sleep satisfaction	Satisfied	14,011 (26.0)
	Neutral	17,793 (33.6)
	Dissatisfied	21,076 (40.4)
Generalized anxiety disorder	Anxiety	6,634 (12.6)
	Normal	46,246 (87.4)
Smartphone overdependence	Overdependence	14,672 (28.0)
	Normal	38,208 (72.0)
Suicide ideation	Yes	7,131 (13.5)
	No	45,749 (86.5)
Depressive symptoms	Yes	13,835 (26.0)
	No	39,045 (74.0)
Violence victimization	Yes	1,399 (2.6)
	No	51,481 (97.4)

Values are presented as weighted mean±standard error or number (weighted %).

rated as "moderate" by 45.3% of adolescents, while 40.4% reported sleep dissatisfaction. In terms of mental health and behavioral characteristics, 12.6% of the adolescents experienced GAD and 28.0% were classified as having smartphone overdependence. Suicidal ideation was reported by 13.5% of participants, depressive symptoms by 26.0%, and victimization through violence by 2.6%.

2. Frequency of Adolescent Problem Behaviors and Gender Differences

The frequency of problem behaviors among adolescents was as follows: 32.6% had alcohol use, 8.6% had smoking, 1.7% had drug use, and 6.5% had sexual experiences (Table 2). There were statistically significant gender differences in alcohol use, smoking, drug use, and sexual experiences ($p<.001$). Specifically, the frequency of alcohol use was 37.5% and 27.4% among male and female adolescents, respectively ($p<.001$). The frequency of smoking was 11.3% and 5.8% among male and female adolescents, respectively ($p<.001$). The frequency of drug use was 1.5% and 1.8% among male and female adolescents, respectively ($p<.001$). The frequency of sexual experiences was 7.8% and 5.1% among male and female adolescents, respectively ($p<.001$).

3. Relationships among Adolescent Problem Behaviors

There were statistically significant relationships among adolescent problem behaviors ($p<.001$) (Table 3). Adolescents who had used alcohol experience had a higher frequency of smoking experience ($\chi^2=6,721.17$), drug use experience ($\chi^2=352.79$), and sexual experience ($\chi^2=2,660.08$) ($p<.001$). Adolescents with smoking experience had a higher frequency of drug use experience ($\chi^2=854.26$) and sexual experience ($\chi^2=5,659.63$) ($p<.001$). Additionally, adolescents with drug use experience had a higher frequency of sexual experience ($\chi^2=724.39$) ($p<.001$).

4. Factors Influencing Adolescent Problem Behaviors

A complex-samples multiple logistic regression analysis was conducted to examine the effects of gender on problem behaviors and of one problem behavior on other problems, while adjusting for control variables (Table 4). In the regression models, the dependent variables were alcohol use, smoking, drug use, and sexual experiences, which were analyzed separately. The independent variables included gender, problem behaviors other than the dependent variable, and 12 control variables.

Model 1: The dependent variable was alcohol use, and male adolescents were significantly more likely to report alcohol use than females (odds ratio [OR], 1.62; 95% confidence interval [CI], 1.54–1.71; $p<.001$). Furthermore, adolescents with alcohol use experience were significantly more likely to engage in other problem behaviors: smoking (OR, 10.49; 95% CI, 9.59–11.48; $p<.001$), drug use (OR, 1.55; 95% CI, 1.28–1.87; $p<.001$), and sexual experience (OR, 2.53; 95% CI, 2.30–2.79; $p<.001$).

Model 2: The dependent variable was smoking and male adolescents were significantly more likely to report smoking than females (OR, 2.06; 95% CI, 1.90–2.24; $p<.001$). Further-

Table 2. Comparison of problem behaviors according to gender in Korean adolescents (N=52,880)

Variable	Total	Gender		χ^2	p[a)]
		Male adolescents	Female adolescents		
Alcohol use experience				625.14	<.001
No	35,604 (67.4)	16,748 (62.5)	18,856 (72.6)		
Yes	17,276 (32.6)	10,021 (37.5)	7,255 (27.4)		
Smoking experience				500.30	<.001
No	48,341 (91.4)	23,795 (88.7)	24,546 (94.2)		
Yes	4,539 (8.6)	2,974 (11.3)	1565 (5.8)		
Drug use experience				10.49	<.001
No	52,041 (98.3)	26,386 (98.5)	25,655 (98.2)		
Yes	839 (1.7)	383 (1.5)	456 (1.8)		
Sexual experience				166.27	<.001
No	49,531 (93.5)	24,751 (92.2)	24,780 (94.9)		
Yes	3,349 (6.5)	2,018 (7.8)	1,331 (5.1)		

Values are presented as number (weighted %), unless otherwise stated.
[a)]Rao-Scott chi-square was used.

Table 3. Relationship between problem behaviors in Korean adolescents (N=52,880)

Variable	Alcohol use experience			Smoking experience			Drug use experience		
	No	Yes	χ^2 ($p^{a)}$)	No	Yes	χ^2 ($p^{a)}$)	No	Yes	χ^2 ($p^{a)}$)
Smoking experience			6,721.17 (<.001)			-			-
No	35,015 (98.3)	13,326 (77.0)		-	-		-	-	
Yes	589 (1.7)	3,950 (23.0)		-	-		-	-	
Drug use experience			352.79 (<.001)			854.26 (<.001)			-
No	35,291 (99.1)	16,750 (96.8)		47,801 (98.8)	4,240 (93.1)		-	-	
Yes	313 (0.9)	526 (3.2)		540 (1.2)	299 (6.9)		-	-	
Sexual experience			2,660.08 (<.001)			5,659.63 (<.001)			724.39 (<.001)
No	34,700 (97.4)	14,831 (85.6)		46,465 (96.0)	3,066 (67.3)		48,943 (93.9)	588 (71.3)	
Yes	904 (2.6)	2,445 (14.4)		1,876 (4.0)	1,473 (32.7)		3,098 (6.1)	251 (28.7)	

Values are presented as number (weighted %), unless otherwise stated.
[a)]Rao-Scott chi-square was used.

Table 4. Factors influencing problem behavior in Korean adolescents (N=52,880)

Independent variables (reference)	Category	Dependent variables							
		Model 1: alcohol use experience		Model 2: smoking experience		Model 3: drug use experience		Model 4: sexual experience	
		$p^{a)}$	AOR (95% CI)	$p^{a)}$	AOR (95% CI)	$p^{a)}$	AOR (95% CI)	$p^{a)}$	AOR (95% CI)
Gender (female)	Male	<.001	1.62 (1.54–1.71)	<.001	2.06 (1.90–2.24)	.250	0.92 (0.80–1.06)	<.001	1.33 (1.21–1.45)
Alcohol use experience (no)	Yes	-	-	<.001	10.85 (9.92–11.86)	<.001	1.70 (1.41–2.05)	<.001	2.62 (2.38–2.89)
Smoking experience (no)	Yes	<.001	10.49 (9.59–11.48)	-	-	<.001	2.38 (1.93–2.93)	<.001	4.91 (4.46–5.40)
Drug use experience (no)	Yes	<.001	1.55 (1.28–1.87)	<.001	2.55 (2.06–3.15)	-	-	<.001	2.10 (1.71–2.59)
Sexual experience (no)	Yes	<.001	2.53 (2.30–2.79)	<.001	4.96 (4.51–5.47)	<.001	2.11 (1.71–2.60)	-	-
Nagelkerke R^2 (p)		.247	(<.001)	.366	(<.001)	.196	(<.001)	.252	(<.001)

Covariates: school type, living arrangement, suicide ideation, depressive symptoms, and violence victimization (categorical variables), age, perceived academic performance, perceived economic status, perceived stress, sleep satisfaction, generalized anxiety disorder, and smartphone overdependence (continuous variables).
AOR, adjusted odds ratio; CI, confidence interval.
[a)]Complex sample multiple logistic regression analysis was used.

more, adolescents with smoking experience were more likely to have used alcohol (OR, 10.85; 95% CI, 9.92–11.86; p<.001), drug use (OR, 2.55; 95% CI, 2.06–3.15; p<.001), and sexual experiences (OR, 4.96; 95% CI, 4.51–5.47; p<.001).

Model 3: Drug use experience was the dependent variable, and no significant gender difference was observed (OR, 0.92; 95% CI, 0.80–1.06; p=.250). However, adolescents who had used drug were significantly more likely to have used alcohol (OR, 1.70; 95% CI, 1.41–2.05; p<.001), smoking experience (OR, 2.38; 95% CI, 1.93–2.93; p<.001), and sexual experience (OR, 2.11; 95% CI, 1.71–2.60; p<.001).

Model 4: The dependent variable was sexual experiences and male adolescents were more likely to report sexual experience than females (OR, 1.33; 95% CI, 1.21–1.45; p<.001). In addition, sexual experience was significantly associated with alcohol use (OR, 2.62; 95% CI, 2.38–2.89; p<.001), smoking

(OR, 4.91; 95% CI, 4.46–5.40; $p < .001$), and drug use (OR, 2.10; 95% CI, 1.71–2.59; $p < .001$).

DISCUSSION

This study, grounded in PBT, examined the prevalence of four adolescent risk behaviors—alcohol use, smoking, drug use, and sexual experiences—and their interrelationships. It analyzed gender differences in these prevalences and their relationships using a nationally representative sample of Korean adolescents. By doing so, the study reaffirms the core PBT assumptions and provides a culturally contextualized understanding of how these behaviors manifest among Korean youth. The findings identified prevalence rates 32.6%, 8.6%, 1.7%, and 6.5%, for alcohol use, smoking, drug use, and sexual experiences respectively. For comparison, the World Health Organization (WHO)'s "Health behavior in school-aged children" report indicates global rates of 57% for alcohol use, 32% for smoking, and 12% for drug use among adolescents [25]. National data from the United States reported that 54% of adolescent girls and 52% of boys have had sexual intercourse [26]. Research on Asian adolescents indicates that over 10% drink alcohol, with Korean and Chinese adolescents showing particularly high rates of alcohol use [27]. Approximately 10% of East Asian adolescents (i.e., Chinese, Korean, and Japanese) reported having sexual experiences [28]. In Korea, the rate of sexual experiences tends to be lower than among their Western counterparts [29]. However, the traditional perception of Asian youth as the "model minority" may contribute to the underestimation of risks associated with adolescent problem behaviors [28]. Underreported prevalence may also reflect gendered reporting tendencies. In Korean cultural contexts, Jee and Lee [30] noted that girls may underreport sexual experiences because of the social stigma associated with deviations from female chastity, whereas boys may overreport them to align with traditional expectations of masculinity. Sexual attitudes in boys are often influenced by personal factors such as curiosity and exposure to sexual media, whereas girls tend to be more affected by family norms and changes in family structure [30], such as the increasing prevalence of nuclear families, which are associated with higher rates of sexual experiences [31]. These cultural and psychosocial factors may help explain the complex patterns of sexual experiences among Korean adolescents.

Significant gender differences were found in alcohol use, smoking, and sexual experiences, with male adolescents reporting higher rates of these problem behaviors. These findings align with those of a study that reported higher levels of problem behaviors among male adolescents in 24 European countries [17]. Girls are generally more health-conscious refrain from risky behaviors owing to social expectations of self-control [32], whereas boys tend to experience more peer pressure, more media influence, and less parental supervision [2,17]. However, this study found no significant gender differences in drug use, which may be related to higher internalizing tendencies among female adolescents [32]. In East Asian cultures, compared to Western societies, personal emotions tend to be suppressed in favor of maintaining a balance between positive and negative affect, particularly among women [33]. Women are also more likely to conceal emotions such as anger and are at greater of risk for depression [34]. Supporting this, a large-scale study of adolescents aged 12–17 years found that female adolescents were significantly more likely to misuse prescription drugs such as painkillers, tranquilizers, and stimulants, whereas male adolescents were more likely to use illicit drugs classified as narcotics [35]. Hence, the absence of gender differences in drug use within this study may mask underlying differences in the types of substances used. Future research in Korea should investigate gender-specific patterns of substance use, focusing on the categories of drugs used.

After controlling for 12 covariates, we found that the four problem behaviors were significantly interrelated. This finding aligns with previous research and supports the tenets of PBT [11,12,36]. Smoking had the strongest associations with alcohol use and sexual experiences with ORs from 10.49–10.85. Smoking was also strongly associated with sexual experiences, with ORs from 4.91–4.96. These results suggest that smoking may play a particularly influential role in the development of other problem behaviors. According to the WHO, adolescents initiate substance use, including smoking, at increasingly younger ages [25]. The major factors contributing to smoking include peer influence, media exposure, parental smoking, and emotional problems such as depression and stress, academic difficulties, and alcohol use [36]. Therefore, interventions targeting smoking may have a broader impact on reducing other adolescent problem behaviors. Given the central role of smoking in the clustering of risky behaviors, increased social attention and policy support for smoking prevention are warranted. By comparing the current findings with those of previous studies, this study revealed both consistent and culturally specific relationship

patterns among problem behaviors. While male-dominant risk behaviors align with global trends, the low prevalence of sexual activity and lack of gender differences in drug use among Korean adolescents may reflect East Asian sociocultural factors, such as hierarchical families, moral education, and strong norms regarding social conformity [33,35]. Thus, adolescent problem behaviors should be viewed as culturally shaped phenomena not merely as developmental outcomes. Addressing clustered adolescent risk behaviors requires integrated, gender-responsive, and culturally contextualized interventions at both school and community levels.

Although this study yielded meaningful findings, it has certain limitations. First, the use of cross-sectional survey data limits the ability to draw causal inferences among the variables. Accordingly, the observed associations should be interpreted as co-occurrence patterns rather than as evidence of causal relationships. Longitudinal research is required to examine the developmental trajectories and temporal sequences of adolescent problem behaviors. Second, although the study utilized nationally representative data, the scope of the available variables was restricted to the dataset. Future studies should incorporate a wider range of psychosocial variables to provide a more comprehensive understanding of adolescent problem behaviors.

CONCLUSION

This study examined gender differences in adolescent problem behaviors and found that male adolescents exhibited higher levels of alcohol use, smoking, and sexual experiences than their female counterparts did. However, no significant gender differences were observed in drug use, suggesting that future interventions should consider gender. Additionally, a strong association was identified between smoking and alcohol use as well as between smoking and sexual experience. These findings indicate that, when implementing interventions for adolescent problem behaviors, simultaneously addressing highly correlated behaviors may be more effective.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: JL, SYP. Data collection: JL. Formal analysis: JL. Writing–original draft: JL, SYP. Writing–review and editing: JL, SYP. Final approval of published version: JL, SYP.

Conflict of interest

Jaeyoung Lee has been an editor of *Child Health Nursing Research* since 2022. She was not involved in the review process of this article. No existing or potential conflict of interest relevant to this article was reported.

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Data availability

Please contact the corresponding author for data availability.

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Factors affecting health promotion behavior of school-aged children in South Korea: a cross-sectional study

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Purpose: This study aimed to identify the factors affecting the health promotion behavior of school-aged children informed by the Information-Motivation-Behavioral Skills Model.
Methods: A cross-sectional study was conducted with 209 fifth- and sixth-grade elementary school students from Seoul, selected through convenience sampling. Data were collected from March 13 to 31, 2023, using a self-administered questionnaire. The questionnaire included validated tools that measured health literacy, attitude toward health behaviors, social support, self-efficacy, and health promotion behavior. Data were analyzed using descriptive statistics, Pearson's correlation, and stepwise multiple regression, using IBM SPSS/WIN ver. 29.0.
Results: The factors influencing the health promotion behavior of school-aged children were social support (β=.43, p<.001), attitude toward health behaviors (β=.27, p<.001), interest in health (high interest group) (β=.14, p=.003), self-efficacy (β=.13, p=.014), and health literacy (β=.10, p=.026). The explanatory power of the model was 63% (F=68.37, p<.001).
Conclusion: Based on the results of this study, it is highly recommended to develop and apply health education and health promotion programs that consider health literacy, attitude toward health behaviors, social support, self-efficacy, and interest in health to foster school-aged children's health promotion behavior.

Keywords: Child; Health behavior; Health promotion; Information Motivation Behavioral Skills Model

INTRODUCTION

School-aged children are those between the ages of 6 and 12 years; this is the time during which they form healthy lifestyle habits, experience gradual physical growth and development, and achieve psychological stability [1]. During this period, children develop a systematic understanding of their health and disease, which continues to evolve. However, current statistics show concerning trends such as an overweight rate of 12% and an obesity rate of 18.3% among elementary school students, resulting in a combined overweight and obesity rate of 30.3%, which has increased from the previous year [2]. Additionally, 29.6% of the first-grade and 51.9% of the fourth-grade elementary school students showed visual impairments. Fortunately, because daily habits are not yet fixed in childhood, acquiring health promotion behaviors is

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easier at this age than in adulthood, and habits formed during this period seamlessly integrate into and persist throughout adulthood [3]. Thus, the school-aged years are a critical period for learning and modifying health-related information, attitudes, and behaviors.

Health promotion behaviors play a key role in predicting both current health status and potential risk of future disease development [4]. Health promotion behaviors are influenced by various factors, including cognitive elements, previous behaviors, and physiological, psychological, and sociocultural factors [3]. To effectively foster health promotion behaviors, factors such as health-related knowledge, attitudes, values, and beliefs must be considered [5]. Schools, where children spend a significant amount of time, provide structured environments for the systematic implementation of health education and promotion programs. Therefore, accurately identifying the factors influencing the health promotion behavior of school-aged children is essential for designing effective health education curricula and programs.

Several theories have attempted to explain health promotion behaviors. Among them, the Information-Motivation-Behavioral skills model (IMB model) provides a comprehensive and useful framework, emphasizing three essential determinants: information (specific facts, heuristics, and implicit theories), motivation (personal motivation, such as attitudes toward health behaviors, and social motivation such as social support), and behavioral skills (individual's objective abilities and self-efficacy) [6]. Initially developed to explain human immunodeficiency virus-related risk behaviors, the IMB model has since been applied to a wide range of health behaviors, including diabetes self-care and breast self-examination in adults, as well as diabetes self-management, obesity prevention, and fruit and vegetable consumption in children and adolescents [6-10]. These applications include both children with chronic conditions and healthy children, demonstrating the IMB model's broad utility across populations. However, few studies have comprehensively examined overall health promotion behaviors among school-aged children using an IMB model-informed approach, as most previous studies have focused on isolated behaviors. Informed by the IMB model and its application in a previous study [6,8], this study selected variables representing each construct—information (health literacy), personal motivation (attitude toward health behaviors), social motivation (social support), behavioral skills (self-efficacy), and health behavior (health promotion behavior)—to identify their combined influence on school-aged children's health promotion behavior. Based on the prior definition and a child-focused IMB study [6,8], behavioral skills were operationalized as self-efficacy in this study. While the original IMB model conceptualizes behavioral skills as a mediator influenced by information and motivation, this study applied a modified approach, guided by a previous child-focused study [8], in which information, motivation, and behavioral skills were treated as independent input variables influencing health behavior.

Given that the school-aged period is a critical stage for establishing lifelong health habits—particularly as national health education begins systematically in grades 5 and 6, integrating health-related knowledge, values, and skills [11]—it is essential to identify the key factors influencing health promotion behaviors during this period. Therefore, this study aims to explore the determinants of health promotion behaviors among school-aged children, guided by the IMB model. The findings of this study are expected to provide foundational data for the development of effective and age-appropriate health education and promotion programs.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Sungshin Women's University (IRB No., SSWUIRB-2023-003). Informed consent was obtained from all participants.

1. Study Design

This cross-sectional study aimed to identify factors influencing health promotion behaviors among school-aged children. The key variables included health literacy, attitude toward health behaviors, social support, and self-efficacy. The reporting of this study followed the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines [12].

2. Study Setting and Sample

The study targeted fifth- and sixth-grade elementary school students from Seoul, selected through convenience sampling. Sample size was determined using the G*Power ver. 3.1.9.7 program (Heinrich-Heine-Universität Düsseldorf), based on previous studies [5,13], with parameters set

as follows: effect size (f^2) = 0.15, significance level (α) = 0.05, power (1–β) = 0.95, and 15 predictor variables. This yielded a minimum sample size of 199. A final sample size of 219 was deemed necessary, accounting for a dropout rate of 10%. The selection criteria were as follows: (1) participants were required to possess verbal communication, reading, and writing abilities and no cognitive impairments; and (2) participation was allowed only after both the student and their legal guardian provided informed consent. Initially, 220 questionnaires were distributed. After excluding 11 incomplete responses, the final sample comprised 209 participants.

3. Measurement Tools

1) General characteristics

To ascertain the general characteristics of the participants, a self-administered questionnaire was developed comprising nine items based on previous studies [1,4,11,13-15].

2) Health literacy

The tool developed by Ahn and Kwon [16] was adapted and modified to measure health literacy. Permission for use and adaptation was obtained from the original developers. The linguistic health literacy assessment tool by Ahn and Kwon [16] is based on the 2009 Health Education Curriculum and evaluates seven domains: daily life and health, disease prevention and management, medication misuse and smoking prevention, sexual health, mental health, society and health, and accident prevention and first aid. It consisted of 42 items with six items per domain. Participants responded "yes" if they thought a statement was correct, "no" if incorrect, or "don't know" if unsure, scoring 1 point for correct answers and 0 points for incorrect or unsure responses. Higher scores indicated greater linguistic health literacy. In the study by Ahn and Kwon [16], Cronbach's α was .86.

For this study, the tool was modified to align with the 2015 Revised Health Education Curriculum, focusing on four key domains: understanding health and disease prevention (eight items), making healthy choices in daily life (11 items), safety and first aid (eight items), and health resources and socio-cultural context (three items). The modified tool contained 30 items to maintain the original scoring system. A nursing professor and three school nurses reviewed the revised items to ensure content relevance and appropriateness.

Additionally, functional health literacy was assessed using the tool by Ahn and Kwon [16], which includes two domains: numerical literacy and reading comprehension literacy. The numerical domain evaluates medication-related skills (six items), scoring 1 point for correct answers. The reading comprehension domain assesses the understanding of snack product labels and children's news articles (six items). Higher scores indicate greater functional health literacy. In the study by Ahn and Kwon [16], Cronbach's α was .68. In this study, linguistic and functional health literacy scores were combined to measure overall health literacy. In this study, Cronbach's α was .77.

3) Attitude toward health behaviors

Attitude toward health behaviors was measured using the "Intention to Act for Better Health" subscale from the Health Attitude Scale by Torabi et al. [17], adapted by Kim [18]. Permission for use was obtained from the original developers. Responses were rated on a 5-point scale ranging from "strongly disagree" (1 point) to "strongly agree" (5 points). Higher scores indicated a more positive attitude toward health behaviors. In the study by Torabi et al. [17], Cronbach's α was .88, and in the study by Kim [18], Cronbach's α was .84. In this study, Cronbach's α was .76.

4) Social support

To measure social support, the tool used by Han and Yoo [19] and further adapted by Ha [20] for elementary school students was used, with permission from the original developers. The tool by Ha [20] consists of three domains: support from friends, family, and teachers. Each domain contains eight items, for a total of 24 items. Responses were rated on a 5-point scale ranging from "strongly disagree" (1 point) to "strongly agree" (5 points). Higher scores indicated greater perceived social support. In the study by Ha [20], Cronbach's α was .93. In this study, Cronbach's α was .91.

5) Self-efficacy

The Korean adaptation of the General Self-Efficacy Scale developed by Lee et al. [21] was used to measure self-efficacy, which is freely available on the website. Responses were rated on a 5-point scale ranging from "not at all true" (1 point) to "exactly true" (5 points). Higher scores indicated greater levels of self-efficacy. In the study Lee et al. [21], Cronbach's α was .75. In this study, Cronbach's α was .87.

6) Health promotion behavior

To measure health promotion behavior, the tool developed

by Nah et al. [22] was adapted and modified, with permission for use and adaptation from the original developers. The tool by Nah et al. [22], based on the 2009 Health Education Curriculum, originally consisted of 29 items across seven units: daily life and health (five items), disease prevention and management (six items), medication misuse and prevention of smoking and drinking (four items), sexual health (seven items), mental health (two items), society and health (two items), and accident prevention and first aid (three items). Responses were rated on a 5-point scale ranging from "strongly disagree" (1 point) to "strongly agree" (5 points). Higher scores indicate a higher degree of engagement in health promotion behavior. In the study by Nah et al. [22], Cronbach's α was .73.

In this study, the tool was modified to align with the 2015 Revised Health Education Curriculum and restructured into four subdomains: understanding health and disease prevention (12 items), making healthy choices in daily life (13 items), safety and first aid (3 items), and health resources and socio-cultural context (1 item), totaling 29 items. The original scoring system was retained. A nursing professor and three school nurses reviewed the revised items to ensure content relevance and appropriateness. In this study, Cronbach's α was .85.

4. Data Collection & Ethical Considerations

Data were collected from March 13 to 31, 2023. Convenience sampling was employed to recruit the participating schools. School-based research involving school-aged children requires multilevel approval from school principals, legal guardians, and the students themselves, which presents practical limitations for participant recruitment. Therefore, convenience sampling was applied to include schools that voluntarily agreed to participate in the study. The selection criteria were as follows: (1) elementary schools located in Seoul; (2) schools with similar numbers of students and comparable health education curricula and hours; (3) inclusion of both 5th- and 6th-grade students from each school; and (4) voluntary participation ensured through written informed consent from both students and their legal guardians. After convenience sampling, the researcher visited the selected schools and provided preliminary explanations to the principals, school nurses, and homeroom teachers. Two schools agreed to participate in the study. The researcher obtained informed consent from both students and their legal guardians through a two-step process. First, a detailed consent form written in accessible language was distributed to legal guardians, outlining the purpose of the study, its voluntary nature, potential risks and benefits, confidentiality protocols, data solely for research purposes, and procedures for withdrawal at any time without penalty. Second, students capable of providing consent were given a simplified verbal explanation of the study and asked to sign a consent form tailored to their age and comprehension level. The participating students were given a token of appreciation.

5. Data Analysis

The collected data were analyzed using IBM SPSS/WIN ver. 29.0 (IBM Corp.). The general characteristics of the participants were analyzed using frequencies and percentages. Health literacy, attitude toward health behaviors, social support, self-efficacy, and health promotion behavior among participants were analyzed using means, standard deviations, and minimum and maximum values. Differences in health promotion behavior according to the participants' general characteristics were analyzed using an independent t-test and one-way analysis of variance, with post hoc tests conducted using the Scheffé test. Correlations among health literacy, attitude toward health behaviors, social support, self-efficacy, and health promotion behavior of participants were examined using Pearson's correlation coefficients. Stepwise multiple regression analysis was conducted to identify the factors influencing health promotion behavior.

RESULTS

1. Differences in the Degree of Health Promotion Behavior according to the General Characteristics of School-Aged Children

Regarding differences in health promotion behavior according to general characteristics (Table 1), there were statistically significant differences by grade ($t = 2.55$, $p = .012$), subjective health status ($F = 6.38$, $p = .002$), academic performance ($F = 5.92$, $p = .003$), interest in health ($F = 12.96$, $p < .001$), experience with school health education ($t = 2.85$, $p = .005$), and subjective family economic status ($F = 18.84$, $p < .001$).

Table 1. Differences in the degree of health promotion behavior according to the general characteristics of school-aged children (N=209)

Characteristic	No. (%)	Health promotion behavior		
		Mean±SD	t / F (*p*)	Post hoc test
Gender			–1.17 (.244)	
Male	104 (49.8)	111.92±13.97		
Female	105 (50.2)	114.20±14.18		
Grade			2.55 (.012)	
5th	77 (36.8)	116.27±14.23		
6th	132 (63.2)	111.20±13.71		
Subjective health status			6.38 (.002)	a>b,c[a)]
Healthy[a]	146 (69.9)	115.22±11.40		
Normal[b]	49 (23.4)	108.94±14.74		
Unhealthy[c]	14 (6.7)	105.07±13.57		
Academic performance			5.92 (.003)	a>b,c[b)]
High[a]	109 (52.2)	115.76±14.42		
Middle[b]	93 (44.5)	110.80±12.93		
Low[c]	7 (3.3)	101.29±14.12		
Experience with hospitalization			–.73 (.470)	
No	120 (57.4)	112.46±14.16		
Yes	89 (42.6)	113.89±14.02		
Source of health information (multiple response)			1.80 (.112)	
Broadcasting media (TV, radio, etc.)	49 (23.4)	114.53±14.39		
Internet, SNS, applications, etc.	62 (29.7)	110.24±12.98		
Print media (book, newspaper, magazine, etc.)	19 (9.1)	116.58±14.35		
Friend or family	65 (31.1)	114.77±16.11		
School class or teacher	35 (16.7)	110.60±12.63		
Health care provider (doctor, nurse, chemist, etc.)	44 (21.1)	116.95±13.47		
Interest in health			12.96 (<.001)	a>b,c,d,e[c)]; b>c[d)]
Very high[a]	29 (13.9)	125.86±11.17		
High[b]	70 (33.5)	115.99±11.50		
Moderate[c]	84 (40.2)	107.93±13.27		
Low[d]	16 (7.7)	107.94±11.56		
Very low[e]	10 (4.8)	106.90±20.19		
Experience with school health education			2.85 (.005)	
No	111 (53.1)	115.63±13.09		
Yes	98 (46.9)	110.16±14.67		
Subjective family economic status			18.84 (<.001)	a>b,c[e)]
High[a]	68 (32.5)	120.85±12.10		
Middle[b]	129 (61.7)	109.74±13.27		
Low[c]	12 (5.7)	104.75±15.18		

Subjective health status was reclassified into three groups: healthy group (very healthy and healthy), normal group (normal), and unhealthy group (slightly unhealthy and very unhealthy).
SD, standard deviation; SNS, social network service.
[a),b),c),d),e)]Post hoc test using Scheffé's test.

2. Health Literacy, Attitude toward Health Behaviors, Social Support, Self-efficacy, and Health Promotion Behavior of School-Aged Children

The average score of health literacy was 29.35±4.22 points out of 42 points. The average score of attitude toward health behaviors was 19.62±3.36 points out of 25 points. The average score of social support was 97.18±13.02 points out of 120 points. The average score of self-efficacy was 35.87±7.34 points out of 50 points. The average score of health promotion behavior was 113.07±14.09 points out of 145 points (Table 2).

3. Correlations among Health Literacy, Attitude toward Health Behaviors, Social Support, Self-efficacy, and Health Promotion Behavior in School-Aged Children

Health promotion behavior was significantly and positively correlated with social support (r=.70, p<.001), attitude to-

ward health behaviors (r = .62, p < .001), self-efficacy (r = .56, p < .001), and health literacy (r = .33, p < .001) (Table 3).

4. Factors Affecting Health Promotion Behavior of School-Aged Children

A stepwise multiple regression analysis was conducted to identify the factors influencing health promotion behavior among school-aged children. The variables included in the analysis were grade, subjective health status, academic performance, interest in health, experience with school health education, and subjective family economic status, which showed statistically significant differences in health promotion behavior among the general characteristics of the participants after being converted into dummy variables. Specifically, for the interest in health variable, two dummy variables were created: "high interest" (coding "very high" and "high" as 1, others as 0) and "low interest" (coding "low" and "very low" as 1, others as 0), with "moderate" interest serving as the reference group. This approach allows for a more nuanced analysis of the impact of different levels of health interest on health promotion behaviors. Health literacy, attitude towards health behaviors, social support, and self-efficacy were set as independent variables and entered into the regression model.

Before conducting the regression analysis, assumptions regarding autocorrelation and multicollinearity were assessed. The Durbin-Watson statistic was 1.69, indicating no evidence of autocorrelation. Visual inspection of the residual scatter plot revealed no systematic pattern, suggesting that the assumptions of independence and homoscedasticity were met. To assess multicollinearity among the independent variables, tolerance values were evaluated, which ranged from 0.612 to 0.893, all well above the commonly accepted threshold of 0.1. The variance inflation factor values ranged from 1.120 to 1.633, all below 10, indicating that multicollinearity was not a concern in the model.

The factors influencing health promotion behavior among school-aged children were health literacy, attitude toward health behaviors, social support, self-efficacy, and interest in health (Table 4). Social support showed the greatest impact (β = .43, p < .001). Attitude toward health behaviors (β = .27, p < .001), interest in health (high interest group) (β = .14, p = .003), self-efficacy (β = .13, p = .014), and health literacy (β = .10, p = .026) were significant predictors of health promotion behavior. The explanatory power of the model was 63% (F = 68.37, p < .001).

Table 2. Health literacy, attitude toward health behaviors, social support, self-efficacy, and health promotion behavior of school-aged children (N=209)

Variable	Mean ± SD	Min–max
Health literacy	29.35 ± 4.22	18–39
Attitude toward health behaviors	19.62 ± 3.36	10–25
Social support	97.18 ± 13.02	63–120
Self-efficacy	35.87 ± 7.34	16–50
Health promotion behavior	113.07 ± 14.09	73–141

SD, standard deviation; Min, minimum; Max, maximum.

DISCUSSION

This study highlights the critical factors to consider when designing health education programs for school-aged children. By identifying significant predictors of health promotion behavior, informed by the IMB model, this study offers practical insights into how theoretical constructs can inform effective strategies in elementary school settings.

Factors affecting health promotion behavior among school-aged children were identified as social support, attitude toward health behaviors, interest in health, self-efficacy, and health literacy. Among the IMB model components, motivational factors such as attitude toward health behaviors and social support emerged as pivotal determinants. These findings support the premise that emotional and interpersonal factors are as critical as cognitive knowledge in shaping chil-

Table 3. Correlations among health literacy, attitude toward health behaviors, social support, self-efficacy, and health promotion behavior in school-aged children (N=209)

Variable	r (p)				
	1	2	3	4	5
1. Health literacy	1				
2. Attitude toward health behaviors	.30 (< .001)	1			
3. Social support	.23 (.001)	.51 (< .001)	1		
4. Self-efficacy	.18 (.008)	.48 (< .001)	.55 (< .001)	1	
5. Health promotion behavior	.33 (< .001)	.62 (< .001)	.70 (< .001)	.56 (< .001)	1

Table 4. Factors affecting health promotion behavior of school-aged children (N=209)

Variable	B	SE	β	t	*p*
(Constant)	25.11	5.78		4.35	< .001
Social support	.46	.06	.43	7.80	< .001
Attitude toward health behaviors	1.12	.22	.27	5.02	< .001
Interest in health (high interest group)	3.97	1.30	.14	3.05	.003
Self-efficacy	.26	.10	.13	2.47	.014
Health literacy	.34	.15	.10	2.24	.026

Dummy variables (reference group)=interest in health (moderate). R^2=.63, adjusted R^2=.62, F (*p*)=68.37 (<.001), Durbin-Watson=1.69.
SE, standard error.

dren's engagement in health promotion behaviors.

Social support demonstrated the strongest effect on health promotion behavior, underscoring its foundational role as a motivational construct in the IMB model. This finding aligns with those of previous studies [1,13], demonstrating that social support is one of the most influential determinants of health promotion behavior among school-aged children. Students who perceived higher levels of social support exhibited significantly more positive health behaviors [4]. Moreover, in a previous IMB model-based study, family support emerged as a significant factor influencing diabetes self-management, indicating that social support plays a crucial role in shaping health-related behaviors [8]. Collectively, these results reinforce the pivotal role of social support as a motivational driver within the IMB framework. As children in this age group rely heavily on relational influences, support from parents, teachers, and peers serves not only as encouragement but also as a behavioral catalyst. This suggests that health programs should include mechanisms that actively engage children's social networks, such as peer-led health activities, peer mentoring, family-school collaborative programs, and teacher-led motivational reinforcement. For instance, peer-led health clubs can organize health mission projects at the class level, such as weekly step counts or food diaries, while utilizing interactive educational methods such as group discussions. Motivating students through mutual encouragement and competition within teams can foster collaborative health promotion in addition to family camps (e.g., exercise and cooking) where parents and children participate together. Furthermore, fostering a supportive and socially safe environment is equally important. Emotional safety is a precondition for behavioral change, and thus, schools should implement anti-bullying initiatives, mentorship programs, and open-access counseling services.

Attitude toward health behaviors was identified as the second most influential factor affecting health promotion behavior among school-aged children. A more positive attitude was associated with greater engagement in health promotion behavior, which is consistent with previous studies in adults [18,23]. However, this contrasts with findings from a study on high school students, in which no significant association was found [24]. Although few studies have specifically examined the relationship between attitudes and health promotion behavior in school-aged children, this discrepancy may be explained by recent developments in health education. Since 2009, systematic school-based health education programs have been implemented in grades 5 and 6 in Korea, and heightened public awareness due to the COVID-19 (coronavirus disease 2019) pandemic has likely contributed to stronger intentions among children to engage in positive health behaviors. These contextual factors may have strengthened the role of attitude as a motivating force for health-related actions among school-aged children. Further studies are needed to repeatedly examine the influence of attitude toward health behaviors. Attitudes are influenced more by social experiences than by individual personality traits, and evolve through experiences and reinforcement rather than being determined solely by personal characteristics [17,25]. Therefore, health education and health promotion programs should not only impart knowledge but also consistently emphasize the value, importance, and necessity of health promotion behaviors. Additionally, health education and programs should include structured reinforcement strategies, such as verbal praise, symbolic rewards, and public recognition, to sustain positive behavioral intentions. Furthermore, the incorporation of emotionally resonant content can foster intrinsic motivation and change long-term attitudes. In this regard, role-playing can be an effective strategy to enhance health attitudes by enabling children to actively experience and reflect on health-related scenarios in a personally meaningful and emotionally engaging way. Collaboration between schools and homes, where teachers and par-

ents demonstrate desirable health behaviors as role models, can help children develop positive attitudes.

Interest in health (high interest group) was a significant factor influencing health promotion behavior. In this study, students who responded "high" or "very high" to the interest in health item demonstrated significantly better health promotion behavior compared to those with moderate interest. Previous studies have indicated a statistically significant difference between interest in health and health promotion behavior [13]. However, few studies have indicated it as a significant factor affecting health promotion behavior, which contrasts with the findings of this study. Notably, interest in health is not an original component of the IMB model; however, this study identified it as a unique and significant predictor of health promotion behavior in school-aged children. This finding suggests that children's interest in health is closely linked to their actual health promotion behaviors. By identifying interest in health as an independent factor, this study expands upon the IMB model framework and indicates that, beyond information, motivation, and behavioral skills, personal interest may serve as an additional facilitator of health promotion behavior. Future studies should continue to investigate the impact of interest in health. Nevertheless, given that this study identified a significant association between interest in health and health promotion behavior among school-aged children, fostering their interest in health could serve as a key motivational factor for maintaining or improving a healthy lifestyle. Therefore, student-centered activities, such as games, simulations, and other diverse educational methods, should be aligned with children's interests and cognitive developmental stages. In particular, gamification-based education has been shown to promote learning, motivation, and problem solving through competition, cooperation, and active participation, and has demonstrated effectiveness in health management, such as oral health [26]. Accordingly, the use of health-themed games in health education should be considered a strategy to enhance students' engagement and sustained interest.

Self-efficacy emerged as a factor that positively influenced health promotion behavior. This finding is consistent with numerous previous studies that have reported self-efficacy as a major factor in enhancing health promotion behavior [1,4,13]. In a study informed by the IMB model, self-efficacy was the most significant factor influencing diabetes self-management, indicating that self-efficacy plays a crucial role in shaping health-related behaviors [8]. Higher self-efficacy has consistently been associated with greater engagement in health promotion behaviors. Self-efficacy is one of the strongest predictors of health promotion behavior [3] and a core behavioral skill in the IMB framework, significantly influencing health promotion behavior [6]. Unlike short-term group education sessions, sustainable behavioral change requires a process in which children independently set goals, monitor their progress, and evaluate outcomes. Particularly, mobile health applications represent a valuable tool for supporting the health and well-being of children [27] and offer a promising strategy for enhancing self-efficacy. Applications that incorporate features such as badges for completing daily hydration or weekly step count challenges can reinforce goal setting, provide real-time progress tracking, and deliver motivational feedback. Therefore, school health education programs should be designed to actively foster self-efficacy through age-appropriate engagement strategies. For example, incorporating digital tools, such as activity tracking apps or interactive behavior contracts, into health classes can help children practice autonomous health management. In-class activities should also guide students through goal setting, self-monitoring, and reflection processes, thereby empowering them to take ownership of their health behaviors both within and beyond the classroom.

Finally, health literacy was positively associated with health promotion behavior and emerged as a significant predictor. This finding is consistent with previous studies on late school-aged children [11] and middle school students [14], which found that linguistic health literacy was a key factor influencing health promotion behavior. Health literacy is recognized as a key determinant of health in both the United States' "Healthy People 2030" and South Korea's "Health Plan 2030," and its significance is acknowledged as a critical strategy for health promotion. Low health literacy tends to lead to more negative health behaviors such as smoking or drinking [28]. In contrast, individuals with higher health literacy exhibit higher rates of disease prevention and healthy behavior practices [29]. The United States has developed the National Health Education Standards, which focus on enhancing students' health literacy, thereby laying the groundwork for health education curricula. In alignment with this approach, incorporating health literacy skills into the health education curriculum is important for improving students' ability to access, understand, and apply health information effectively. Health literacy refers to the ability to recognize health-related issues and make informed decisions by acquir-

ing, understanding, and utilizing the health information and services necessary for maintaining well-being [30]. To enhance health literacy, it may be beneficial to design simulation-based educational programs that involve identifying relevant information for simulated scenarios, evaluating the appropriateness of the information, and effectively applying it within the context of the simulation. Furthermore, considering the recent trends highlighting the use of digital devices and emphasizing digital literacy, methods, and technologies that can enhance health literacy and apply e-health literacy should be included in health education.

CONCLUSION

This study, informed by the IMB skills model, identified key factors influencing health promotion behavior among school-aged children. Health literacy, attitude toward health behaviors, social support, self-efficacy, and interest in health were all found to significantly impact health promotion behavior. Of these, social support emerged as the most influential factor. These findings underscore the importance of developing and implementing school-based health education and promotion programs that address not only cognitive knowledge but also motivational and behavioral skills tailored to the developmental characteristics of school-aged children.

Several recommendations are made based on the findings of this study. First, because this study used a convenience sample of fifth- and sixth-grade students from two elementary schools in a single city, caution is warranted when generalizing the results. Future studies should include a more diverse sample of school-aged children from various regions and school settings to enhance the generalizability of the findings. Second, although this study applied a modified IMB model, it may not fully capture the complex and dynamic interrelationships among the variables. Future studies should employ advanced analytical methods, such as structural equation modeling, to explore potential mediating and moderating effects and elucidate causal pathways. Finally, intervention studies are needed to design, implement, and evaluate school health education and promotion programs grounded in the IMB model to promote sustainable health behaviors among school-aged children and improve long-term health outcomes.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: BRL, CMC, DHK. Methodology: BRL, CMC, DHK. Data collection: BRL. Formal analysis: BRL. Validation: CMC, DHK. Investigation: BRL. Writing-original draft: BRL. Writing-review and editing: BRL, CMC, DHK. Supervision: CMC, DHK. Project administration: CMC. Final approval of published version: BRL, CMC, DHK.

Conflict of interest

Dong Hee Kim has been an editor of *Child Health Nursing Research* since 2016. She was not involved in the review process of this article. No existing or potential conflict of interest relevant to this article was reported. This article was adapted from a thesis by Bo Ra Lim in partial fulfillment of the requirements for the master's degree at Sungshin Women's University.

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Data availability

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Factors affecting the emotional intelligence of adolescents during the COVID-19 pandemic: a descriptive study in South Korea

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Purpose: This descriptive study aimed to identify the factors affecting adolescents' emotional intelligence during the COVID-19 (coronavirus disease 2019) pandemic.
Methods: We utilized the 4th-year data from the 2018 Korean Children and Youth Panel Survey, which comprise 1,852 adolescents living with both parents. The determinants of adolescents' emotional intelligence were analyzed through stepwise multiple regression, considering parental, family, and school factors.
Results: Parental factors, such as parents' grit and emotional intelligence, were found to enhance adolescents' emotional intelligence. Family factors, including parents' positive parenting attitude and the average time spent with parents, also significantly enhance adolescents' emotional intelligence. School factors, such as the number of remote class days during the previous semester, influenced adolescents' emotional intelligence.
Conclusion: Parental and family factors enhanced emotional intelligence, whereas school factors, particularly remote learning, negatively impacted it. The model explained 67.5% of variance, with parents' emotional intelligence being the strongest predictor. Interventions should prioritize enhancing parental emotional competence and maintaining meaningful parent-child interactions, especially during educational disruptions.

Keywords: Adolescent; Emotional intelligence; Korea; Psychology recognition

INTRODUCTION

In 2023, the obligation to wear a mask in schools was relaxed in South Korea. However, many adolescents continue to wear them. This choice is not solely for illness prevention purposes but also owing to psychological and social factors that emerged during the coronavirus disease 2019 (COVID-19) pandemic [1]. For some adolescents, masks have become a way to hide their expressions [1]. Due to prolonged remote schooling, adolescents have become more accustomed to online communication. As a result, they often struggle to express their feelings and thoughts, and their ability to interpret non-verbal expressions has diminished, leading to a greater tendency to misread others' emotions [2]. Particularly, adolescents face unprecedented challenges and stress, as they have to gauge and understand the emotions of others through the movement of their eyes and eyebrows while their mouth is covered by a mask [3]. Adolescence refers to the transitional period between childhood and adulthood, during which physical, psychological, emotional, and social changes become prominent [4]. This phase is particularly unstable due to intense emotional experiences, making accurate emotion recognition and expression critical for effective emotion regulation and the development of interpersonal relationships [5]. Accordingly, several experts have emphasized the importance of early intervention during this

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period to mitigate long-term risks [6].

Emotional perception refers to the ability to recognize one's own emotions in affective, cognitive, and physical states [7]. Additionally, one can also recognize the emotions and psychological states of others and respond appropriately. This ability is called emotional intelligence [8]. Those able to perceive their emotions have higher levels of autonomy, clearer self-boundaries, and are psychologically healthier and more adaptable [9], given that they experience fewer emotional conflicts and can initiate effective coping strategies in challenging situations [10]. Therefore, emotional intelligence serves as a key factor in forming positive social relationships; it involves having a clear understanding of oneself and others and being able to adapt to social situations. Consequently, emotional intelligence is a core competency that is essential in the current era [3].

Adolescence is a period marked by multidimensional changes in emotional intelligence [11,12]. During this period, the ability to recognize and appropriately respond to the emotions and psychological states of others is a key skill and indicator of one's role as a member of society [3]. According to previous studies, emotional intelligence supports individuals' positive functioning, thereby enhancing life's meaning and satisfaction, as well as psychological well-being [13]. Therefore, strengthening emotional intelligence in adolescents is essential for overall development and social, academic, and professional success.

Emotions are conveyed via verbal expressions and various non-verbal elements such as facial expressions, tone/volume of voice, and gestures [14]. It is particularly important to understand the emotions behind others' facial expressions and respond appropriately to nurture effective interpersonal relationships [15]. Given the widespread school closures and transition to remote learning during the COVID-19 pandemic, the importance of emotional intelligence in adolescents has gained increased attention [16]. As mask-wearing has become a part of everyday life, facial expressions serve as a crucial lens through which adolescents' emotional intelligence can be better understood [3]. Since facial expressions are among the most immediate and powerful cues for recognizing others' emotions, the ability to accurately interpret these cues is a fundamental component of emotional intelligence, enabling individuals to respond appropriately in social interactions [3,14-16]. However, previous studies on emotional intelligence have focused only on self-awareness of emotions and verbal expression [17]. They have not identified and investigated the environmental changes caused by the pandemic—including the need to wear masks.

To address this gap, the present study examined adolescents' ability to recognize the emotions and psychological states of others and analyzed the parent, family, and school factors affecting this ability. According to the ecological perspective [18], which emphasizes that individual behavior is greatly influenced by the environment and requires a multifaceted approach, adolescence is a critical period where environmental factors are especially important and can be considered in terms of family and school environments. Against this backdrop, this study analyzes adolescents' emotional intelligence from an ecological perspective, considering the personal and environmental characteristics of the family and school domains. Specifically, it examined adolescents' emotional intelligence amid the social changes following the COVID-19 pandemic, especially in 2021, which marked the transition from online education to in-person classes.

This study aimed to determine the parental, family, and school factors that affected the emotional intelligence of adolescents who experienced a period of limited social interaction owing to the COVID-19 pandemic, particularly after their return to face-to-face learning.

METHODS

Ethical statements: This study was approved by the Institutional Review Board of Baekseok University (IRB No. BUIRB-202407-HR-045). It utilized the second set of data released to the public through the Korean Children and Youth Panel Survey, obtained from the National Youth Policy Institute.

1. Research Design

This descriptive, cross-sectional secondary data analysis utilized the Korean Children and Youth Panel Survey (KCYPS) data from the National Youth Policy Institute (NYPI) to identify the factors affecting emotional intelligence among adolescents. This paper was composed according to the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines [19].

2. Study Setting and Sample

We utilized the 2018 KCYPS data from the NYPI, which dynamically examined Korean adolescents' health behaviors and changing patterns. To systematically and multidimensionally examine the complex patterns of changes in the growth and development of children and adolescents, the KCYPS conducted a 7-year follow-up study, which began in 2018, with first-year middle school students and continued to 2024, when the participants reached their first year of university [20]. This study's sample was drawn from first-year middle school students. Considering the subjective value system of parents and the socio-economic aspects that affect the growth and development of adolescents, a simultaneous survey was conducted with parents and children. Adolescents were surveyed regarding their personal development and developmental environment, whereas their parents or guardians were individually interviewed about various background variables (e.g., education, occupation, and income level), their characteristics, and their adolescents' developmental background [20].

The survey population for the 2018 KCYPS was established using the 2017 Education Statistics provided by the Ministry of Education. A multi-stage stratified cluster sampling method was employed, targeting first-year middle school students across 17 metropolitan cities and provinces nationwide [20]. First, regions and city size were selected as factors affecting adolescents' development, according to which the status of the population was identified. By determining the number of students in each of the 17 metropolitan cities and provinces, according to the proportion of the total number of students, a minimum sample size of two or more schools was determined. Regarding each stratum, the number of students was determined by probability-proportional-to-size sampling, allocating the number of classes based on the size of the region, living environment, and educational conditions. To be eligible as a sample school, the school had to have at least two classes and a minimum of 50 students. If these conditions were not met, the school was replaced with a neighboring school. Classes were randomly selected, one per school, and all students in the selected classes were surveyed. The survey data were collected using tablet PCs and individual face-to-face interviews. Weights were applied to reflect the differences in the sampling rate, response rate, and the changed population that might have occurred owing to the survey [20].

We targeted adolescents who were in their third year of middle school in 2020, when the COVID-19 outbreak became a pandemic, and who became first-year high school students in 2021. In total, 2,265 first-year middle school students were included; the KCYPS data from their fourth year—when entering their first year of high school—were used. Subsequently, this study matched these data with the adolescents' guardian data to obtain a final sample of 1,852 adolescents who were living with both parents. This sample comprised 81.8% of the original 2,265 students in the fourth year of the panel of first-year middle school students who participated in the survey.

3. Variables and Measurements

1) Parental factors

Parents' grit and emotional intelligence were included as parental factors that may affect adolescents' emotional intelligence. To examine parents' grit, KCYPS used the instrument originally developed by Duckworth [21] and subsequently adapted to a Korean version [22]. This tool comprises eight questions scored on a 4-point Likert scale ranging from 1="strongly disagree" to 4="strongly agree." Four questions are reverse-coded and scores range between 8 and 32, with higher scores indicating higher grit. The Cronbach's α in the study by Kim and Hwang [22] was 0.71, and 0.62 in this study. Parents' emotional intelligence was measured using 28 questions from the Reading the Mind in the Eyes Test (RMET), which was used in the 20th Korea Labor and Income Panel Study, based on Baron-Cohen et al. [23]. This tool assesses the ability to recognize others' emotions by making the individual choose one of four words that describe the emotions or thoughts from the eyes and facial expressions of others; the more words selected correctly, the higher the individual's ability to understand others' emotions. The Cronbach's α in this study was 0.69.

2) Family factors

Parents' positive attitudes, average time spent with parents per day, family income level, and the presence of siblings were included as family factors that may affect adolescents' emotional intelligence. The KCYPS examined parenting attitude, as perceived by adolescents, using the Parents as Social Context Questionnaire for Korean Adolescents [24]. This study used the domains corresponding to "warmth, support for autonomy, and provision of structure" and conducted a confirmatory factor analysis using AMOS to determine whether the three factors explained parents' positive parent-

ing attitudes. Consequently, the following values were obtained: χ^2=380.12 (degrees of freedom=51, p<.001), Tucker-Lewis index=0.962, comparative fit index=0.970, root mean square error of approximation=0.059 (90% confidence interval, .05–.07), and standardized root mean square residual=0.032, indicating that the model was appropriate for measuring positive parenting attitude. Each of the three factors constituting a positive parenting attitude—warmth, autonomy support, and structure provision—was evaluated using four questions, for a total of 12 questions. The scores ranged from 1="strongly disagree" to 4="strongly disagree," with higher scores indicating a more positive parenting attitude, as perceived by the adolescent. The Cronbach's α for parents' positive parenting attitude was 0.91 in the current study and that of Kim et al. [25].

The average time spent with parents per day, in hours and minutes, was calculated using the following formula: [(5×average time spent with parents on weekdays)+(2×average time spent with parents on weekends)]/7. Data on family income level were obtained from the adolescents' parents using a survey. The subjective family income level was classified into five categories, from the lowest to the highest, and further classified into three categories: high, middle, and low. The presence of siblings, including the respondent, was indicated using a dummy variable ("no" if the number of siblings was one, and "yes" if the number was two or more).

3) School factors

The high school type, the size of the city where the school is located, and the number of remote class days were included as school factors that may affect adolescents' emotional intelligence. The school types were first classified as regular, autonomous, or special-purpose high schools. Subsequently, they were reclassified as regular high school or other. The size of the city where the school was located was classified into three categories: large city, small- or medium-sized city, and town or township. The number of remote class days was determined based on how many days, on average, the school had remote classes during the first semester of 2021.

4) Emotional intelligence of adolescents

To measure adolescents' emotional intelligence, this study used 28 questions from the RMET, which was used in the 20th Korea Labor and Income Panel Study, based on Baron-Cohen et al. [23]. The RMET measures the respondent's ability to guess the emotions of others from observing their eyes and facial expressions. The scores ranged from 0 to 28, with a higher score indicating a higher level of emotional intelligence. The Cronbach's α for the RMET was 0.72 in this study and that of the study by Kim et al. [26].

4. Data Analysis

The data were analyzed using IBM SPSS ver. 25.0 (IBM Corp.), and all statistical assessments utilized a two-tailed test with a significance level of .05. Descriptive statistics and a frequency analysis were used to identify participants' general characteristics. Using independent t-tests and one-way analysis of variance, we determined the differences in adolescents' emotional intelligence based on individual, family, and school factors. Furthermore, post hoc analyses were conducted using Scheffe's test. Using Pearson's correlation coefficients, we determined the correlation of adolescents' emotional intelligence with parental, family, and school factors. The influence of parental, family, and school factors on adolescents' emotional intelligence was examined using multiple regression analysis, in which variables were entered sequentially by factor group. Before implementing the regression analysis, the variance inflation factor index was used to determine the correlations among the independent variables. It indicated a value ≤2.22, suggesting the absence of multicollinearity [27]. The Durbin-Watson test provided a value of 2.03, indicating the absence of autocorrelation between the independent variables [28].

RESULTS

1. Participants' General Characteristics

The adolescent participants comprised 984 males (53.1%) and 868 females (46.9%), and 87.9% of the participants had siblings. The average time spent with parents per day was 3.45±2.43 hours. Regarding the family income level of these adolescents, 201 (10.9%) of their parents believed theirs was "high," while 1,442 (77.9%) and 209 (11.3%) believed theirs was "medium" and "low," respectively. Most participants attended regular high schools (81.0%), while 351 (19.0%) attended autonomous, special purpose, or specialized vocational high schools. Regarding the size of the city where the school was located, 819 adolescents (44.4%) attended schools in large cities, 748 (40.5%) attended schools in small- or medium-sized cities, and 278 (15.1%) attended schools in towns or

townships. The mean number of remote class days per week in the previous semester (2021) was 1.6±1.22 days (Table 1).

2. Differences in Adolescents' Emotional Intelligence Based on General Characteristics

Table 2 presents the differences in adolescents' emotional intelligence based on their general characteristics. No differences were found in adolescents' emotional intelligence by gender (t=–0.47, p=.641) or sibling status (t=–1.31, p=.191). Adolescents with a "low" family income level had higher emotional intelligence than those with a "medium" family income level (F=6.23, p=.002), whereas the group attending other schools had higher emotional intelligence than the group attending regular high schools (t=–5.17, p<.001). Moreover, adolescents who attended high school in small- or medium-sized cities and those attending high school in towns or townships had higher emotional intelligence than those attending high school in large cities (F=6.04, p=.002).

Table 1. General characteristics of participants (N=1,852)

Characteristic	Value
Gender	
Male	984 (53.1)
Female	868 (46.9)
Presence of siblings	
No	225 (12.1)
Yes	1,627 (87.9)
Average time spent with parents per day (hr)	3.45±2.43
Family income level	
High	201 (10.8)
Middle	1,442 (77.9)
Low	209 (11.3)
Type of high school	
Regular high school	1,494 (81.0)
Other	351 (19.0)
Size of the city where the school is located	
Large city	819 (44.4)
Small- or medium-sized city	748 (40.5)
Town or township	278 (15.1)
No. of remote class days per week in the previous semester	1.60±1.22

Values are presented as number (%) or mean±standard deviation.

Table 2. Differences in adolescents' emotional intelligence based on general characteristics (N=1,852)

Characteristic	Emotional intelligence		
	Mean±SD	t/F	p
Gender			
Male	15.22±5.95	–0.47	.641
Female	15.36±6.18		
Presence of siblings			
No	14.79±5.99	–1.31	.191
Yes	15.35±6.06		
Family income level			
High[a]	15.80±5.94	6.23	.002
Middle[b]	15.04±6.11		(b<c)
Low[c]	16.51±5.65		
Type of high school			
Regular high school	14.96±6.17	–5.17	<.001
Other	16.65±5.35		
Size of the city where the school is located			
Large city[a]	14.77±6.23	6.04	.002
Small- or medium-sized city[b]	15.54±5.98		(a<b,c)
Town or township[c]	16.07±5.60		

SD, standard deviation.

Table 3. Correlation of adolescents' emotional intelligence with parental, family, and school factors (N=1,852)

	Parental		Family		School	Adolescents' emotional intelligence
	Parents' grit	Parents' emotional intelligence	Positive parenting attitude	Average time spent with parents per day	No. of remote class days per week in the previous semester	
Parental						
Parents' grit	1	.13 (<.001)	.16 (<.001)	.10 (<.001)	–.13 (<.001)	.15 (<.001)
Parents' emotional intelligence	.13 (<.001)	1	.22 (<.001)	.25 (<.001)	–.28 (<.001)	.82 (<.001)
Family						
Positive parenting attitude	.16 (<.001)	.22 (<.001)	1	.30 (<.001)	–.14 (<.001)	.23 (<.001)
Average time spent with parents per day	.10 (<.001)	.25 (<.001)	.30 (<.001)	1	–.14 (<.001)	.26 (<.001)
School						
No. of remote class days per week in the previous semester	–.13 (<.001)	–.28 (<.001)	–.14 (<.001)	–.14 (<.001)	1	–.27 (<.001)
Adolescents' emotional intelligence	.15 (<.001)	.82 (<.001)	.23 (<.001)	.26 (<.001)	–.27 (<.001)	1

Values are presented as r (p).

3. Correlation of Adolescents' Emotional Intelligence with Parental, Family, and School Factors

Table 3 presents the correlation of adolescents' emotional intelligence with parental, family, and school factors. Regarding parental factors, parents' grit increased as adolescents' emotional intelligence increased, exhibiting a positive correlation (r=.15, p<.001). Additionally, the parents' emotional intelligence exhibited a positive correlation with that of adolescents (r=.82, p<.001). Regarding family factors, parents' positive parenting attitude (r=0.23, p<.001) and average time spent with the parents per day (r=.26, p<.001) were positively correlated with adolescents' emotional intelligence. Conversely, the mean number of remote class days per week in the previous semester was negatively correlated with adolescents' emotional intelligence (r=–.27, p<.001).

4. Effects of Parental, Family, and School Factors on Adolescents' Emotional Intelligence

To determine how parental, family, and school factors affected adolescents' emotional intelligence, a stepwise multiple regression analysis was performed using significant variables from the mean comparison and correlation analyses. The significance test indicated that all models for emotional intelligence were significant. The explanatory powers were 67.0% for model 1 (F=1,867.64, p<.001), 67.3% for model 2 (ΔR^2=.005; F=643.58, p<.001), and 67.5% for model 3 (ΔR^2=.002; F=383.17, p<.001) (Table 4).

Model 1, which included the parental factors, indicated that parents' grit and emotional intelligence significantly affect adolescents' emotional intelligence. Greater levels of parental grit were associated with higher emotional intelligence

Table 4. Effect of parental, family, and school factors on adolescents' emotional intelligence (N=1,852)

Type of factor	Factor	Model 1					Model 2					Model 3				
		B	SE	β	t	*p*	B	SE	β	t	*p*	B	SE	β	t	*p*
	(Constant)	0.95	0.66		1.43	.153	–0.26	0.82		–0.31	.753	0.77	0.88		0.87	.385
Parental	Parents' grit	0.10	0.03	.04	3.27	.001	0.08	0.03	.04	2.67	.008	0.08	0.03	.03	2.45	.015
	Parents' emotional intelligence	0.78	0.01	.81	60.09	<.001	0.76	0.01	.79	56.44	<.001	0.75	0.01	.78	53.83	<.001
Family	Positive parenting attitude						0.04	0.02	.04	2.55	.011	0.04	0.02	.03	2.37	.018
	Average time spent with parents per day						0.13	0.04	.05	3.54	<.001	0.12	0.04	.05	3.36	.001
	Family income level (middle: 1)						–0.14	0.26	–.01	–0.54	.593	–0.12	0.26	–.01	–0.45	.651
	Family income level (high: 1)						–0.02	0.35	–.01	–0.05	.957	0.01	0.35	.01	0.02	.985
School	Type of high school (other: 1)											0.01	0.21	.01	0.06	.956
	Size of the city where the school is located (small- or medium-sized city: 1)											–0.32	0.24	–.03	–1.32	.187
	Size of the city where the school is located (large city: 1)											–0.44	0.24	–.04	–1.84	.067
	No. of remote class days per week in the previous semester											–0.18	0.07	–.04	–2.57	.010
	F (*p*)	1,867.64 (<.001)					634.58 (<.001)					383.17 (<.001)				
	R^2	.670					.674					.676				
	Adjusted R^2	.669					.673					.675				
	ΔR^2						.005					.002				

Model 1: adjusted for parental factors; model 2: model 1+adjusted for family factors; and model 3: model 2+adjusted for school factors.
SE, standard error.

among adolescents (β = .04, p = .001), and higher parental emotional intelligence positively affected adolescents' emotional intelligence (β = .81, p < .001).

In model 2, which included parental and family factors, parents' grit (β = .04, p = .008) and emotional intelligence (β = .79, p < .001) affected adolescents' emotional intelligence. Moreover, positive parenting attitudes were associated with higher levels of emotional intelligence among adolescents (β = .04, p = .011). Similarly, spending more time with their parents was associated with higher emotional intelligence among adolescents (β = .05, p < .001). Notably, the subjective income level of the family had no significant effect on adolescents' emotional intelligence.

In model 3, which incorporated parental, family, and school factors, parents' grit (β = .03, p = .015) and emotional intelligence (β = .78, p < .001) affected adolescents' emotional intelligence. Regarding family factors, positive parenting attitude, as perceived by adolescents (β = .03, p = .018), and the average time spent with their parents (β = .05, p = .001) positively affected adolescents' emotional intelligence. Regarding school factors, an increase in the number of remote class days in the previous semester negatively impacted adolescents' emotional intelligence (β = –.04, p = .010), whereas the type of high school and the size of the city where the school was located exhibited no significant effects on adolescents' emotional intelligence (β = –.04, p = .067).

DISCUSSION

This study analyzed the factors that influenced the emotional intelligence of adolescents whose social relationships were affected by social distancing and remote classes during the COVID-19 pandemic. KCYPS data were used for third-year middle school students who experienced social isolation in 2020 owing to the COVID-19 pandemic and who became first-year high school students in 2021.

Regarding parental factors, parents' grit and emotional intelligence positively affected adolescents' emotional intelligence. Those with high grit tended to focus on their goals for longer periods, maintain perseverance, even in challenging situations, and not give up easily [29]. Their perseverance was especially evident in their relationships with their children and the continuous fulfillment of their responsibilities to support their children's growth. According to Yoon and Choi [30], parental grit goes beyond enduring difficulties, requiring parents to consistently show commitment and patience in daily interactions with their children, which in turn positively influences the children's emotional development. To successfully raise their children, parents must constantly exercise patience to overcome the difficulties encountered during the process. Additionally, parents are required to change their roles as their children grow, which means that they need to develop new roles and abilities as their children grow. A 6-year longitudinal study demonstrated that parents who maintain consistent emotional warmth and adapt their control strategies flexibly create optimal conditions for children's psychological flexibility and emotional development, which forms the foundation for enhanced emotional intelligence [31]. This assists children in learning to overcome challenges and difficulties, thereby strengthening their emotional empathy and ability to understand others' emotions, ultimately improving their emotional intelligence.

Parents' emotional intelligence strongly influences that of adolescents, indicating that parents' emotional intelligence affects the development of their children's emotional recognition. Moreover, parents' emotional intelligence has a modeling effect on their children, becoming a learning tool for them [32]. Children consciously and unconsciously learn and imitate, resulting in the modeling of emotional interactions as well as emotional expressions and coping. Those adolescents who can recognize and internalize their emotions are more likely to accurately understand and empathize with others' emotions [33]. Furthermore, recognition of one's own emotions leads to better emotion regulation and fewer emotional conflicts during adolescence [34]. Therefore, an elevated level of emotional intelligence in parents positively affects the development of adolescents' emotional intelligence. The survey was conducted in 2021, when social isolation began owing to the COVID-19 pandemic and continued until 2021. During this period, the time spent at home increased dramatically, suggesting that the relationship with parents was the most significant factor affecting adolescents' emotional development. This finding emphasizes the importance of developing educational programs for parents, to improve their emotional intelligence and promote emotional interactions with their children. This must be developed while considering the unique Korean culture, which emphasizes interdependence and bonding and values emotional closeness, in contrast to Western culture, which focuses on individuality and independence [35].

Regarding family factors, adolescents' emotional intelligence increased as they perceived their parents' parenting at-

titude more positively. This was consistent with previous studies reporting that a positive parenting attitude is a significant factor in adolescents' emotional development [36,37], indicating that positive interactions with parents play a key role in children's emotional development. Several previous studies have reported that the parent–child relationship is a key factor in the formation and maintenance of a child's healthy self-image and interpersonal relationships and that the parenting quality provided by parents is closely related to the mental health of children [36-38]. Therefore, a positive parenting experience received from parents can enhance adolescents' emotional intelligence [38]. This means that programs that positively improve parents' parenting attitudes can be an important foundation for adolescents' emotional intelligence.

Additionally, more time spent with parents positively affected adolescents' emotional intelligence. This was consistent with the results of a study in the United Kingdom [39], which found that adolescents with relatively high mental health problems before the pandemic improved on all subscales of mental health during the pandemic. This was attributed to enhanced parent–child interactions owing to increased time spent at home during the pandemic. Notably, although this study examined the quantity of time spent with parents, not the quality, it found a positive impact on adolescents' emotional intelligence. This suggests that parents should not feel burdened by focusing too much on the quality of emotional interactions, given that the hours that parents and children spend together daily can provide a sense of security and emotional development among children. Accordingly, social efforts are required to increase the time that parents and children spend together at home and to establish family-friendly policies that allow parents and children to naturally engage in emotional exchanges in their daily lives, even if the interactions are not special or deep.

In the present study, the subjective family income level had no significant effect on adolescents' emotional intelligence, suggesting that emotional intelligence is closely related to the emotional environment rather than the economic environment. This finding differs from that of previous studies [39]. Dissimilar to previous studies, this study examined the family's income level based on the subjective perception of the parents rather than objective indicators, which may have led to this discrepancy. Moreover, economic factors can operate in a complex manner, not only concerning income levels, but also in conjunction with numerous factors such as a country's social support system, welfare levels, and cultural background [40]. Therefore, future studies should conduct a more in-depth analysis of the impact of economic factors on adolescents' emotional intelligence, including objective economic indicators.

Regarding school factors, an increase in the number of remote class days negatively influenced adolescents' emotional intelligence. This is consistent with previous studies showing that remote classes negatively impacted adolescents' psychosocial development during the pandemic [41]. These results suggest that the absence of face-to-face interactions and the resulting isolation might have hindered adolescents' emotional development. Conversely, the type and region of school had no significant effect on adolescents' emotional intelligence. This suggests that changes in educational methods had a greater impact on emotional intelligence than school type and regional differences, emphasizing the necessity of developing integrated programs that promote effective peer interactions and emotional exchanges by improving the remote education environment in crises such as pandemics. These findings are in line with previous research indicating that the lack of in-person interaction during remote learning can impede adolescents' emotional and social growth [42,43]. Interpreting these results in the context of prior studies, it becomes clear that targeted interventions within the school environment are crucial to mitigating the negative effects of social isolation during crises. Particularly, in such crises, adolescents' emotional development should be enhanced through video-based small group activities, online mentoring, and virtual counseling services, emphasizing the role of school nurses and teachers.

Despite its contributions, this study has some limitations. First, it did not consider the adolescent participants' characteristics, given that it focused on environmental factors that affected emotional intelligence. Future studies should examine individual factors that affect emotional intelligence from multiple perspectives. Second, this study was a cross-sectional examination; thus, the identification of causal relationships between variables is limited. In the future, longitudinal studies should be conducted to determine how the emotional intelligence of adolescents who had experienced the pandemic changed over time. Third, family income level was assessed solely on parents' perceived subjective household economic status. Future research should incorporate multiple indicators to provide a more comprehensive analysis. Fourth, this study did not consider the interactive effects of various inter-

personal and community factors such as peer relationships, community, and school health policies. Follow-up studies should include these factors to explore emotional intelligence from a broader perspective. Despite these limitations, the contributions of this study are significant, given that it targeted adolescents who experienced the COVID-19 pandemic and comprehensively analyzed their parental, family, and school factors.

CONCLUSION

This study examined the factors that affected adolescents' emotional intelligence during the COVID-19 pandemic. The results indicated that positive parental and family environments significantly enhanced adolescents' emotional intelligence, while certain school-related experiences, such as prolonged remote learning, impacted it negatively. The results of this study provide valuable insights for policymakers, researchers, and practitioners to minimize emotional distress among adolescents and support their healthy development during crises, such as pandemics. Based on the findings, this study proposes a multidimensional approach that considers all three factors—parental, family, and school—to improve adolescents' emotional intelligence.

Regarding parental factors, parental education programs should be developed to improve parents' grit and emotional intelligence. Importantly, training programs that strengthen emotional expression, understanding, and regulation ability should be included to improve parents' emotional intelligence. Future research should empirically evaluate the effectiveness of these parent-focused programs in enhancing adolescent outcomes.

Regarding family factors, parent counseling or coaching programs should be established to promote positive parenting attitudes. Moreover, programs to strengthen family activities and emotional bonds should be expanded to ensure that parents and children spend sufficient time together. Community health nurses and school nurses should provide family-centered assessments and guide parents in implementing emotional support strategies that enhance parent-child interactions. In particular, high-quality interaction time between parents and children should be guaranteed through policies that support parents' work–life balance. Future research could contribute to such programs by investigating which types of family activities and policies most effectively foster emotional intelligence in adolescents.

Finally, regarding school factors, an emotional support system in remote class environments should be established. To ensure active emotional interactions between teachers and students and between students in a non-face-to-face environment, classes focused on interactions should be designed and an online counseling system should be established. School nurses should lead the implementation of emotional intelligence screening programs, provide immediate crisis intervention for students showing emotional distress, and collaborate closely with teachers to identify and support students at risk during remote learning periods. It is recommended that future studies assess the impact of such school-based interventions on students' emotional intelligence and well-being, especially in digital or hybrid learning environments.

From a nursing practice perspective, adolescent care nurses should be equipped with emotional intelligence assessment tools and evidence-based intervention strategies. In addition, training programs for school nurses and community health nurses should focus on recognizing signs of emotional difficulties, implementing preventive measures, and providing continuity of care during educational disruptions such as pandemics. Such a multidimensional approach should be achieved through cooperation between parents, families, and schools, particularly during crises, such as pandemics.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: KL, HC. Methodology: KL, HC. Formal analysis: HC. Investigation: KL, HC. Data curation: HC. Writing: KL, HC. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

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Data availability

The data used in this study are available from the National

Youth Policy Institute at http://www.nypi.re.kr/archive. Data access procedures and documentation are in Korean.

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Instructions to Authors

CHNR
Child Health Nursing Research

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Enacted in April 2006, and most recently revised in November 2024 and, applied from Vol. 31, No. 1 (2025 January)

I. Aim and Scope

Child Health Nursing Research (CHNR) aims to promote the health, development, and well-being of children and their families in Korea and all over the world by disseminating research on evidence-based practices.

Its scope includes the most recent clinically and academically relevant topics in health care and nursing from the beginning of life to young adulthood, including both children and their families. The journal publishes articles that address research, theory, and practice in a wide range of child health nursing areas and relevant cultural issues.

The primary readers of this journal include healthcare professionals, administrators, educators, caregivers, researchers, and various specialists dedicated to serving newborns, infants, children, adolescents, young adults, and their families. The ultimate goal of CHNR is to build a robust body of knowledge that will help improve clinical practice and community care to promote the health of children and families worldwide.

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CHNR is committed to ensuring ethics in scientific research and publishing. For the policies on research and publication ethics that are not stated in these instructions, the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals by International Committee of Medical Journal Editors (ICMJE) or the COPE Guidelines (https://publicationethics.org/guidance/Guidelines) can be applied. Furthermore, all processes of handling research and publication misconduct will follow the applicable COPE flowchart (https://publicationethics.org/resources/flowcharts).

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Table 1. Authorship Taxonomy (https://credit.niso.org/)

Term	Definition
Conceptualization	Ideas; formulation or development of overarching research goals and aims
Methodology	Development or design of methodology; creation of models
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components
Validation	Verification, whether as a part of the activity or separate, of the overall replication/ reproducibility of results/experiments and other research outputs
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection
Resources	Provision of study materials, reagents, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools
Data curation	Management activities to annotate (produce metadata), scrub data, and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse
Writing–original draft	Preparation, creation, and/or presentation of the published work, specifically writing the initial draft (including substantive translation)
Writing–review & editing	Preparation, creation, and/or presentation of the published work by those from the original research group, specifically critical review, commentary, or revision—including pre-or post-publication stages
Visualization	Preparation, creation, and/or presentation of the published work, specifically visualization/data presentation
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Authors are required to disclose commercial or similar relationships to products or companies mentioned in the article being submitted or related to its subject matter. The corresponding author must notify the editor of any potential conflicts of interest that might have affected the study's findings or the way the data were interpreted. Even if the authors are certain that their respective judgments were unaffected when producing the article, any potential conflict of interest should be stated on the title page and at the ending section of the manuscript. Conflicts of interest can include ties to pharmaceutical corporations on a personal or financial level, political pressure from special interest organizations, or issues in the classroom.

Before evaluating a particular paper, CHNR requests that referees notify the editor if they have any conflicts of interest. All article submissions from editors, staff members, or editorial board members are handled in the same manner as unsolicited submissions. They will not participate in the decision-making or reviewer selection process. Even for commissioned manuscripts, editors will not handle their own work.

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Authors should report their work accurately and objectively without inappropriate manipulation. Authors should describe their methods and procedures in enough detail and present sufficient references so that others can replicate the work. Authors should not produce, record, or report nonexistent data and results and should not change or omit data. Authors should also avoid producing multiple publications ("salami slicing") from content that should be only one substantial manuscript. Manuscripts that do not follow the international ethical standards of research and publication (i.e., those that involve fabrication, falsification, salami slicing, plagiarism, or simultaneous/duplicate submission) will not be considered for publication in CHNR. The editorial board will adjudicate the specific reasons for rejection.

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Registration with an accredited primary registry is essential for clinical research to ensure transparency and accountability. In Korea, the Korea Clinical Research Information Service (CriS, https://cris.nih.go.kr/) serves as an accredited primary registry recognized by the World Health Organization (https://www.who.int/clinical-trials-registry-platform).

ClinicalTrials.gov (https://clinicaltrials.gov), managed by the United States National Institutes of Health, is also a widely accepted registry.

However, registration may be waived if the study involves an educational intervention that poses no harm to participants. In such cases, authors are encouraged to discuss the need for registration with the editor, considering the specific nature of the educational intervention.

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If authors find a fundamental error in a published manuscript, they should immediately inform the editor and cooperate with the editor to correct or withdraw the manuscript.

9. Process for Managing Publication Malpractice

If reviewers or readers suspect publication malpractice such as fabrication, falsification, salami slicing, plagiarism, or simultaneous/duplicate publication; inappropriate changes in authorship, an undisclosed conflict of interest, ethical problems with a submitted manuscript, a reviewer who has appropriated an author's idea or data, complaints against editors, and so on, the resolution process will be initiated following the flowchart provided by the COPE (https://publicationethics.org/guidance/Flowcharts). The ethics committee will discuss and adjudicate cases of suspected publication malpractice, as well as complaints and appeals against editors. CHNR will not hesitate to publish errata, corrigenda, clarifications, retractions, apologies, and expressions of concern when needed.

10. Disclosure of Artificial Intelligence (AI)–Assisted Technology

CHNR follows the Artificial Intelligence (AI)–Assisted Technology policy described in Recommendations of ICMJE (https://www.icmje.org/icmje-recommendations.pdf).

Authors must disclose if they used AI-assisted technologies (e.g., LLMs, chatbots, image generators) in their work. The use of AI should be described in the cover letter and relevant sections of the manuscript, acknowledging writing assistance in the acknowledgment section and data-related uses in the Methods section. For instance, writing assistance should be noted in the Acknowledgments section, while uses in data collection, analysis, or figure generation should be detailed in the Methods section. AI tools such as chatbots should not be listed as authors, as they cannot be held responsible for accuracy or integrity. Authors are responsible for ensuring the work's quality, reviewing AI-generated content for errors or bias, and avoiding plagiarism, including proper attribution for AI-generated text or images.

III. Guidelines for Manuscript Preparation

1. Types of Manuscripts

CHNR publishes original articles, review articles, and editorials on health care and nursing for birth to young people and their families.

1) **Original articles:** CHNR publishes original articles that fit the journal's aims and scope. These are comprehensive papers that present novel research findings. They include reports of empirical data from top-notch scientific and clinical research studies that are relevant to nursing and health care for people from the beginning of life to young adulthood and their families. Original articles cover children's health issues, with topics encompassing nursing theory, practice, and education, among others. The articles published in CHNR present significant research results obtained using a variety of methodologies, including mixed-method designs, observational, quasi-experimental, and experimental investigations, as well as qualitative methods and measurements, including the development and evaluation of instruments. The appropriate standards should be followed when writing research papers.

2) **Review articles:** Critical presentations on themes of interest and importance to child health nursing theory, practice, and education are included. A review article's body should consist of a thorough evaluation of the literature that is supported by academic research, critical analysis, and reasoned conclusions. CHNR publishes comprehensive literature reviews, as well as systematic reviews that target specific research problems, such as scoping reviews. It also issues discussion papers, which are academic works with a discursive or argumentative tone. All articles must contain a discussion and critical evaluation of a significant body of research or other scholarship.

3) **Editorials:** Editorials are by invitation only and feature re-

marks made by institutional representatives or individual authors on topics of current interest. Authors should contact the manager in the editorial office if they have any suggestions for editorials that deal with topics that are critically important to the discipline, especially those that are contentious or closely related to recent or upcoming journal articles.

2. Authors of Manuscripts

Anyone may submit a manuscript for publication in CHNR. If the manuscript is derived from a dissertation, the author must disclose that the manuscript is the product of a dissertation for an academic degree program. The first author must be the author of the dissertation.

3. General Information

1) Language and style: Every manuscript should be written in English. The author can submit the manuscript as a Microsoft Word file or HWP file with an A4 paper size layout. The margins of the paper should be set as follows: top 30 mm, bottom 25 mm, left 25 mm, and right 25 mm. A 10-point font size should be used, and the text should be double-spaced.

2) Manuscript length: Abstracts, texts, references, tables, and figures included in the manuscript have different limits depending on the type of manuscript submitted, but all submissions must comply with the contents of Table 3. The number of references is recommended to be 30 or fewer for an article. However, authors may include additional references depending on the type of article, such as meta-analyses, systematic reviews, or structural equation models.

Table 3. Recommended maximums for articles submitted to *Child Health Nursing Research*

Publication type	Word count of abstract	Word count of main text	Numbers of tables & figures
Original article	250	6,000	5
Review article	250	8,000	5
Editorial	N/A	2,500	5

3) Abbreviations used: If authors choose to use an English abbreviation, the complete spelling must be used upon first mention, and the abbreviation may be used after that. The title should not include any abbreviations.

4) Samples and participants: Authors should confirm the correct use of the words "sex" (when reporting biological factors) and "gender" (identity, psychosocial, or cultural factors), and report the sex or gender of study participants. Authors should define how they determined race or ethnicity and justify its relevance. If a study was done involving an entire population, the authors should explain the reason.

5) Prior approval for the use of psychosocial questionnaires (survey tools): Authors must obtain permission for the utilization of any psychosocial questionnaire from the tool's copyright holder.

6) Describing machinery or technical equipment: When identifying machinery and equipment, the following should be included in parentheses: the model and manufacturer. Brand names are identified by ™, ®, etc. Brand names should be used only when necessary.

7) Reference and citation style: References and citations follow National Library of Medicine [NLM] style. The submitting authors are responsible for ensuring adherence to NLM guidelines.

8) Inclusive language: Authors are encouraged to use inclusive language that acknowledges diversity, respects all individuals, and promotes equal opportunities. Assumptions about the reader's beliefs or identities should be avoided, and authors must refrain from language that implies superiority based on factors such as age, gender, race, ethnicity, culture, sexual orientation, disability, or health condition. Writing should be free of bias, stereotypes, and cultural assumptions. Gender neutrality is encouraged by using plural nouns (e.g., "patients") instead of gendered pronouns ("he/she"). Descriptors of personal attributes should only be used if relevant and valid.

4. Reporting Guidelines for Specific Study Designs

Research reports frequently omit important information. Therefore, reporting guidelines have been developed for a number of study designs. Authors are encouraged to adhere to relevant reporting guidelines when describing their study. A good source of reporting guidelines is the EQUATOR Network (https://www.equator-network.org/) and the United

States National Institutes of Health/ National Library of Medicine (https://www.nlm.nih.gov/services/research_report_guide.html)

1) Observational cohort, case-control, and cross-sectional studies: Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)

2) Qualitative studies: Consolidated Criteria for Reporting Qualitative Research (COREQ), Standards for Reporting Qualitative Research (SRQR)

3) Quasi-experimental/non-randomized trials: Transparent Reporting of Evaluations with Non-randomized Designs (TREND)

4) Randomized (and quasi-randomized) controlled trials: Consolidated Standards of Reporting Trials (CONSORT)

5) Study of diagnostic accuracy/assessment scale: Standards for the Reporting of Diagnostic Accuracy Studies (STARD)

6) Systematic review and meta-analysis: Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA), Meta-analysis of Observational Studies in Epidemiology (MOOSE)

7) Quality improvement studies: Standards for Quality Improvement Reporting Excellence (SQUIRE)

5. Sequence of Headings in an Original Article

The manuscript should be organized as follows. Each section should be clearly delineated. Instructions for each appear below the list.

Beginning section	- Cover letter - Title page - Abstract and keywords
Middle section (main text)	- Introduction - Methods - Results - Discussion - Conclusion
Ending section	- ORCID and ResearcherID - Authors' contributions - Conflict of interest - Funding resource - Data availability - Acknowledgements - Declaration of generative AI and AI-assisted technologies in the writing - Supplementary materials - References
Other elements	- Tables and Figures

1) Beginning section

(1) Cover letter

The authors should include a cover letter to the editor in which they summarize the main components of the manuscript and what makes its contribution original and relevant to the Aims and Scope of CHNR. The author(s) should also address any other matters associated with authorship and publication they wish the editors to consider.

(2) Title page

① The content of the title page should appear as follows in this order: Title, running title, type of manuscript, author(s), corresponding author, conflict of interest, IRB approval, Medical Subject Headings (MeSH, https://www.ncbi.nlm.nih.gov/mesh/) keywords, number of references, and number of words of the English abstract. More specific requirements for these components are detailed below.

② Type of manuscript: One of the following should be noted: original article, review article, editorial, or invited paper.

③ Author(s): This section should list the names of all authors, each with their position and affiliation including title, department, and location of institutions to which the work should be attributed. It should also present each author's ORCID number, ResearcherID and describe the author's role in this study.

④ Corresponding author: The corresponding author should be identified with their address (including zip code), email, telephone number, fax number, and ORCID number or ResearcherID.

⑤ Conflict of interest: Any matter pertaining to the research should be noted here, such as the source of research funds, conflicts of interest, or indication that the manuscript is derived from a dissertation or thesis for an academic degree program.

⑥ IRB approval: The author should provide information about the institution that provided IRB approval, in-

cluding the approval number, and informed consent. However, if the study did not involve humans or animals, a statement should be made about IRB exemption.

⑦ MeSH Keywords: The keywords are drawn from the MeSH list (not more than five).

⑧ Number of references: It is recommended that an article include no more than 30 references. However, for articles that have no reference restriction, such as meta-analyses, systematic reviews, or structural equation models, authors are free to provide more references.

⑨ Number of words in the abstract: The number of words in the abstract should be noted. The total should be no more than 250 words.

(3) Abstract and keywords

An abstract of up to 250 words for articles (including reviews) should be on a separate page. It should cover the main factual points, including statements of the purpose, methods, results, and conclusions. The abstract should be accompanied by a list of three to five keywords for indexing purposes. The keywords should be as specific as possible and drawn from the list of MeSH keywords.

2) Middle section

The text should be composed in the following order: Introduction, Methods, Results, Discussion, and Conclusion.

(1) Introduction: The introduction should clearly state the need for this study and the main question or hypothesis of the study. A literature review or summary of background information related to the study should be presented.

(2) Methods: This section should describe the study design, setting and samples, ethical considerations, measurements/instruments, data collection/procedure, and data analysis used. If the study is qualitative, the research instrument can be omitted. An "Ethics statement" should be provided after the "Methods" heading in a text-box format.

Example 1:
Ethics statement: This study was approved by the Human Ethics Committee of the University of XXX (IRB No. 202104-0002-03). Informed consent was obtained from all participants (or their parents/legal guardians).

Example 2:
Ethical statements: This study is a literature review of previously published studies and was therefore exempt from Institutional Review Board approval.

(3) Results: The main results should be summarized in concise paragraphs. Levels of statistical significance and confidence intervals should be noted where appropriate.

(4) Discussion: The discussion should be based only on the reported results. The discussion is recommended to reflect advances in nursing practice and nursing knowledge development.

(5) Conclusion: Conclusions and recommendations for further study should be presented here, but the study results should not be summarized again.

3) Final section

(1) ORCID and ResearcherID: The authors should provide the ORCID number and ResearcherID.

(2) Authors' contributions: Authors' contributions should be based on the authorship taxonomy.

(3) Conflict of interest: Authors are required to disclose commercial or similar relationships to products or companies mentioned in or related to the subject matter of the article being submitted. If there are no conflicts of interest, the following is an example of a sentence that can be used: "No existing or potential conflict of interest relevant to this article was reported."

(4) Funding resource: Funding institutions' policies should acknowledge sources of funding for the manuscript. If there is no funding resource, the following is an example of a sentence that can be used: "None".

(5) Data availability: Based on the plan for data sharing, authors should deposit their data after de-identification and report the DOI of the data and the registered site. The corresponding author should be contacted to confirm the availability of data.

Example 1:
The data cannot be publicly disclosed due to the Data Use Agreement with the Society for OOO (OOO). For the research data, contact the OOO (URL) / or the corresponding author's name (abcde@gmail.com).
Example 2:
Data files are available from Harvard Dataverse: https://doi. org/10.7910/OOO/3OOO9O Dataset 1. Raw data of responses from South Korean nursing students in 202X.

(6) Acknowledgments: Any persons who contributed to the study or the manuscript but did not meet the authorship requirements can be listed here. Written permission should be obtained from any person or organization mentioned in this section.

(7) Declaration of generative AI and AI-assisted technologies in the writing: Authors are required to disclose the utilization of generative AI and AI-assisted technologies in the writing process by including a statement after their work within the main text file, before the References list. The declaration must be positioned in a new section headed "Declaration of Generative AI and AI-assisted Technologies in the Writing Process."

Example:
During the preparation of this work the author(s) used [NAME TOOL/SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

This declaration excludes using basic tools to check grammar, spelling, references, etc. A statement is unnecessary if there is no information to provide.

(8) Supplementary materials: If there are supplementary materials to help the understanding of readers or too much data to be included in the main text, they may be presented as supplementary data.

(9) References: Manuscripts submitted must adhere to the NLM citation style, with authors responsible for ensuring compliance with NLM guidelines and the accuracy of all references. Authors are responsible for the accuracy of the references. The use of DOIs is highly encouraged.

(10) Tables and Figures: The total number of tables and figures in a manuscript is no more than 5. All tables and figures should be easy to understand, even when presented separately from the rest of the manuscript, and should present information relevant to the study.

6. References Format

A description of the References section is provided below. The references are formatted according to *Citing Medicine: The NLM Style Guide for Authors, Editors, and Publishers* (https://www.ncbi.nlm.nih.gov/books/NBK7256/) if not mentioned below. The references should be numbered serially in the order of appearance in the text, with numbers in brackets [ ]. The original reference number should be used if a reference is cited more than once. If there are 7 or more authors of a cited work, the first 6 should be listed, followed by "et al."

1) Journals

The name of the journal should be written in full. For 6 or fewer authors, all authors should be listed. For more than 6 authors, the first 6 should be listed, followed by et al.

- Lee SJ, Han YR. The influencing factors of pediatric nurses' perception of patient safety culture and partnership with patients' parents on patient safety nursing activities in South Korea: a descriptive study. Child Health Nurs Res. 2024;30(4):255-265. https://doi.org/10.4094/chnr.2024.008
- Kang HK, Kim TB, Kim KH, Kim MJ, Kim JH, Kim HY, et al. Development and effect of a metabolic syndrome prevention program for university students using mobile application. Child Health Nurs Res. 2014;20(3):205-214. https://doi.org/10.4094/chnr.2014.20.3.205
- Cesare M, Cocchieri A. Can an increase in nursing care complexity raise the risk of intra-hospital and intensive care unit transfers in children? A retrospective observational study. J of Pediatr Nurs. 2024 Nov 28 [Epub]. https://doi.org/10.1016/j.pedn.2024.11.015
- Cho CU. Stem cell windpipe gives Korean toddler new life. The Korea Herald. 2013 May 2;Sect. 01.

2) Books & Book chapters

- Brown B. Braving the wilderness: the quest for true belonging and the courage to stand alone. Random House: 2017.

- Peate I. The student's guide to becoming a nurse. 2nd ed. John Wiley & Sons; 2012.
- Min KA, Kim CG. Nursing management. Knowledge & Future; 2012.
- Bochner BH. Identification of nodal metastases: the role of iron oxide enhanced MRI. In: Lee CT, Wood DP, editors. Bladder cancer. Humana Press; 2010.
- Radley DC, How SK, Fryer AK, McCarthy D, Schoen C. Rising to the challenge: results from a scorecard on local health system performance, 2012 [Internet]. Commonwealth Fund; 2012 [cited 2017 Feb 8].

Available from: https://www.commonwealthfund.org/sites/default/files/documents/___media_files_publications_fund_report_2012_mar_local_scorecard_1578_commission_rising_to_challenge_local_scorecard_2012_finalv2.pdf

3) Scientific and technical reports

- Korean Women's Development Institute. 2015 National multicultural family survey report. Ministry of Gender Equality & Family; 2016. Report No.: MOGEF2016-3.
- Won YJ, Shin HR, Jeong GW, Shin AS, Gong HJ, Oh CM, et al. Cancer registration & statistics branch, division of cancer registration & surveillance. National Cancer Control Institute Annual Report. National Cancer Center; 2012. Report No.: 2012.11-13520000010145-10.

4) Unpublished theses or dissertations

- Lee YH. Development and effects of nocturnal emission and menstruation education program using CAI for Korean elementary school children [dissertation]. Ewha Womans University; 2010.
- Choi JW. Clinical characteristics and treatment outcomes of pediatric neurofibromatosis type 2: Neurosurgical series [master's thesis]. Seoul National University; 2013.

5) Conference proceedings

- Bell JM. Highlights from the 10th international family nursing conference. 10th International Family Nursing Conference; 2011 June 24-28; Kyoto. Sage Publications; 2012. p. 135-139.

6) Web

- Statistics Korea. Cause of death statistics in 2023 [Internet]. Statistics Korea; 2024 [cited 2024 Dec 10]. Available from: https://kostat.go.kr/board.es?mid=a20108100000&bid=11773&act=view&list_no=433679

7. Tables and Figures Format

1) Table formatting

① All lines should be single. Vertical lines should not be used.

② The title of a table should appear above the table. Only capitalize the first letter of table titles. Ex) Table 1. Responses to question types

③ Tables should be numbered consecutively, e.g., Table 1, Table 2, and so on.

④ Table data should be explained in the footnotes. All abbreviations used in the tables should be defined in the footnotes of every table in which they appear. Ex) HR, heart rate; T, temperature.

⑤ In a table, use a superscript lowercase letter to indicate each footnote. The tables should be placed beneath the footnotes. Ex) [a]Surviving case; [b]Deceased case.

⑥ If the value of a decimal can possibly exceed 1, a 0 should appear before the decimal point; otherwise, nothing should appear before the decimal point. Ex) $t = 0.26$, $F = 0.92$ Example: $p < .001$, $r = .01$, $R^2 = .61$

⑦ The statistical significance (p-value) should be written without a footnote and should be rounded to three decimal places. Ex) $p = .003$. If p is 0.000, then indicate that p is less than 0.001 ($p < .001$). If p is 1.000, then indicate that p is greater than 0.999 ($p > .999$).

2) Illustration and photograph format rules

① The title should appear below an image. Only the first letter of the first word should be capitalized (sentence case). Ex) Figure 1. Mean responses to questions by student grade categories.

② Acceptable figure file formats are BMP, JPG, PSD, TIF, AI, EMF, EPS, WMF, DOC, XLS, PPT, and PDF.

③ The size of the image should be 102×152 mm (4×6 inches). Larger images may be permitted; however, each image should not exceed 203×254 mm (8×10 inches).

④ If one figure contains 2 or more images, consecutive alphabetical letters should be used to distinguish among the images. Ex) Figure 1A, Figure 1B

⑤ The photomicrograph of a tissue sample, the region from which the tissue was extracted, and the staining

method should be noted. The magnification scale must be included.

3) Quotations from other sources

Citations may follow any style, such as NLM, APA, or others.

IV. Submission and Peer Review

1. Submission

Manuscripts must be submitted through the CHNR website (http://www.e-chnr.org/) or CHNR peer review system (http://www.chnr-submission.org/). Authors may review the submission instructions and access all submission forms, including the author checklist. During submission, information on the authors' ORCIDs and the ResearcherID will be requested. All required forms are available on the journal's website (https://www.e-chnr.org/) and the Korean Academy of Child Health Nursing's website (https://www.child-nursing.or.kr).

2. Peer Review

1) Policy: All papers, including those invited by the editor, are subject to peer review. Two or more reviewers and the editor will conduct a **double-blind** peer review of each manuscript. The Editorial Board selects reviewers based on expertise, publication history, and past reviews. During the peer review process, reviewers can interact directly or exchange information (e.g., via submission systems or email) with only an editor, which is known as "independent review." An initial decision will normally be made within two weeks after the reviewers agree to review a manuscript. No information about the review process or editorial decision process is published on the article page.

2) Preview: The editorial committee initially evaluates each submission. The main goal is to quickly determine which papers should not be sent for peer review and which ones should. To prevent delays for authors who may wish to submit their work elsewhere, papers that do not meet basic standards or are unlikely to be published, even with a favorable peer review—such as those with insufficient novel contributions or unclear relevance to the field—may be rejected at this stage.

3) Peer review process and the author's response to the reviewers' comments

There is a two-week peer review period, and the first decision is made after the evaluation is finished. Following the review, the Editorial Board will decide between the options: acceptable options include minor revision, major revision, or rejection. The Editorial Board may request authors to make changes to the manuscript in response to reviewers' comments. The author should reasonably indicate if the reviewer's opinion is unacceptable or if the reviewer is thought to have misinterpreted the data. The authors should try their best to comply with any requests made by the reviewers to modify the manuscript.

After making changes to the manuscript, the author should upload the updated files along with a response to each reviewer's comment. Revisions from the author must be finished within 15 days of the request. The Editorial Board will inform the author if it is not received by the deadline. The author should discuss an extension with the Editorial Board if they want to prolong the revision window past 15 days. Up to two rounds of the manuscript evaluation process may be offered. The Editorial Board may consider further review upon the author's request. The Editorial Board will ultimately decide whether to approve the submitted manuscript for publication and may, if necessary, ask for additional alterations, edits, and deletions to the article text. Statistical editing is also done if a statistician needs to review the data professionally.

The editor-in-chief of CHNR will make the final decision regarding the manuscript's publication based on the reviewers' comments and the scientific merits of the manuscript. Any potential or existing conflict and issues in the manuscript must be discussed in detail with the Editorial Board.

4) Submission by editors: All manuscripts from editors, employees, or editorial board members are processed the same way as other unsolicited manuscripts. Editors will not handle their own manuscripts even if they are commissioned. During the review process, they will not engage in the selection of reviewers and the decision process.

More details on other pertinent regulations are available on the journal's website. If there are any questions regarding the use of the online submission system, authors may contact the editorial office of CHNR.

5) **Appeals of decisions:** Any appeals against the editorial decision must be made within 2 weeks of the date of the decision letter. Authors who wish to appeal against a decision should contact the Editor-in-Chief, explaining in detail the reasons for the appeal. All appeals will be discussed with at least one other associate editor. If consensus cannot be reached thereby, an appeal will be discussed at a full editorial meeting. The process of handling complaints and appeals follows the guidelines of COPE available from (https://publicationethics.org/appeals). CHNR does not consider second appeals.

V. Final Preparation for Publication

1. Final Version

After the paper has been accepted for publication, the author(s) should submit the final version of the manuscript. The names and affiliations of the authors should be double-checked, and if the originally submitted image files were of poor resolution, higher-resolution image files should be submitted at this time. Symbols (e.g., circles, triangles, squares), letters (e.g., words, abbreviations), and numbers should be large enough to be legible on reduction to the journal's column widths. All symbols must be defined in the figure caption. If references, tables, or figures are moved, added, or deleted during the revision process, renumber them to reflect such changes so that all tables, references, and figures are cited in numeric order.

2. Manuscript Corrections

Before publication, the manuscript editor will correct the manuscript so that it meets the standard publication format. The author(s) must respond within 48 hours when the manuscript editor contacts the corresponding author for revisions. If the response is delayed, the manuscript's publication may be postponed to the next issue.

3. Proofs and Reprints

The author(s) will receive the final version of the manuscript as a PDF file. Upon receipt, the author(s) must notify the editorial office of any errors found in the file within 48 hours. Any errors found after this time are the responsibility of the author(s) and will have to be corrected as an erratum.

4. Correction

To correct errors in published articles, the corresponding author should contact the journal's editorial office with a detailed description of the proposed correction. Corrections that seriously affect the interpretation or conclusions of the article will be reviewed by the editors. Corrections will be published as an author correction or a publisher correction in a later issue of the journal.

Minor errors will be corrected directly in the online version of the article. An indication of the correction, along with the date it was made, will be added to the article information in both the HTML and PDF versions. A separate correction note will not be published.

VI. Article Processing Charge

After the acceptance of a manuscript, the author is responsible for the following fees: the publication fee, the special typesetting fee, and the printing fee for each volume of the paper. Upon acceptance, an article-processing charge (APC) of 600,000 Korean won per article is requested from the corresponding author.

Authors in developing countries (https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf) may be exempt from author fees after negotiation with the Editorial Board.

If at least one of the authors is a member of the Korean Academy of Child Health Nursing, the paper qualifies for a discounted submission.

VII. Copyright, Open Access Policy

1. Copyright

All manuscripts published in CHNR are protected by copyright. The copyright and the transfer right of the digital content of the published paper and journal are owned by the Korean Academy of Child Health Nursing. All authors should agree to the copyright transfer during the submission process.

After the acceptance of the manuscript, the author must submit the copyright transfer agreement to the Korean Academy of Child Health Nursing. All authors should print their names and sign the copyright transfer agreement.

2. Open Access Policy

CHNR is an open-access journal. Articles are distributed under the terms of the Creative Commons Attribution-Non-Commercial-NoDerivatives 4.0 (CC BY-NC-ND 4.0) license, which permits copying and distributing the material in any medium or format in unadapted form only, for noncommercial purposes only, and only if attribution is given to the CHNR. This is in accordance with the Budapest Open Access Initiative definition of open access. It also follows the open access policy of PubMed Central at United States National Library of Medicine (http://www.ncbi.nlm.nih.gov/pmc/).

All articles published in the journal are freely available through open access for everyone to read and download from the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication.

VIII. Other Editorial Policy

1. Data Sharing Policy

To verify study accuracy and reproducibility, authors are encouraged to deposit raw or analyzed data in a public repository, such as Harvard Dataverse (https://dataverse.harvard.edu/dataverse/), Open Science Framework (https://osf.io/), etc. upon acceptance of the manuscript. Submission of raw or analyzed data is highly recommended. Authors should provide the relevant website URL or sources if data are already public. Authors may discuss options with the editor if data cannot be publicized. Based on the degree of the sharing plan, authors should deposit their data after de-identification and report the DOI of the data and the registered site. Authors with questions about data deposition are encouraged to contact the editorial office.

2. Archiving Policy

All manuscripts published in CHNR are freely available through open access to read and download from any electronic link, including those found on the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication. In the event CHNR is no longer published, previously published articles will continue to be available via the National Library of Korea (http://nl.go.kr), PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/journals/4129/), and Science-Central (https://www.e-sciencecentral.org/journals/169/).

3. Preprint Policy

A preprint can be defined as a version of a scholarly paper that precedes formal peer review and publication in a peer-reviewed scholarly journal. CHNR allows authors to submit preprints to the journal. Preprints are not treated as duplicate submissions or duplicate publications. CHNR recommends authors to disclose preprint status with a DOI in the letter to the editor during the submission process. Otherwise, the submission may be flagged by a plagiarism check program—Similarity Check (Crosscheck) or Ithentificate, etc.. Preprint submissions will be processed through the same peer-review process as usual submissions. If a preprint is accepted for publication, authors are recommended to update the information in the preprint with a link to the published article in CHNR, including the DOI in CHNR. It is strongly recommended that authors cite the article in CHNR instead of the preprint in their next submission to a journal.

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Child Health Nursing Research

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Please check the items below (if indicated) before submission of the manuscript:

1. GENERAL CONSIDERATION

□ This article has not been published elsewhere and will not be published elsewhere.
□ The manuscript is typewritten and double-spaced in a file formatted for A4-sized paper.
□ The number of pages including tables and figures is no more than 20.
□ The parts of the manuscript are presented in the following order: title page, English abstract, introduction, methods, results, discussion, conclusions, conflicts of interest, acknowledgments, references, tables, and figures.
□ Page numbers appear at the bottom of each page.

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