

CHNR

Child Health Nursing Research

Vol.31, No.2, April 2025

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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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Printed April 30, 2025 Published April 30, 2025

Published by the Korean Academy of Child Health Nursing

College of Nursing, Daegu Catholic University, Korea
Tel: +82-53-650-4829, Fax: +82-53-650-4392, e-mail: hykoo@cu.ac.kr

Printed by M2PI

#805, 26 Sangwon 1-gil, Seongdong-gu, Seoul 04779, Korea
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Editorial	79	The changing landscape of pediatric infectious diseases before, during, and after the COVID-19 pandemic Byung Wook Eun
Original Articles	85	Predictive factors of adolescents' happiness: a random forest analysis of the 2023 Korea Youth Risk Behavior Survey Eun Joo Kim, Seong Kwang Kim, Seung Hye Jung, Yo Seop Ryu
	96	Happiness experiences among South Korean elementary school students receiving local children's center services: a qualitative study using Giorgi's phenomenological method Hae Kyung Jo
	107	Development of an integrated health promotion program for school-age children from vulnerable families in South Korea: a methodological study Eunjeong Bae, Eun Kyoung Choi
	120	Factors influencing on future core nursing competency: focusing on King's Dynamic Interaction System Model in South Korea: a cross-sectional study Cheol Eon Park, Jeonghun Kang, Soon Hyun Myung, Hyun Seo Yoo, In Young Cho

The changing landscape of pediatric infectious diseases before, during, and after the COVID-19 pandemic

Byung Wook Eun

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The coronavirus disease 2019 (COVID-19) pandemic has fundamentally altered the epidemiology, clinical presentation, and management of infectious diseases in children worldwide. The implementation of unprecedented public health measures, including school closures, mask mandates, and social distancing, not only curtailed the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) but also dramatically shifted the prevalence and seasonal patterns of other common pediatric infections. As we now survey the post-restriction landscape, a complex picture has emerged, revealing both immediate and delayed effects on pediatric infectious disease trends. This editorial reviews the evolving patterns of childhood infections before, during, and after the COVID-19 pandemic and highlights substantial changes in disease prevalence, seasonality, and severity that pose new challenges for healthcare providers.

1. Direct impact of COVID-19 on children: an evolving narrative

The impact of SARS-CoV-2 infection on pediatric populations has changed markedly over the course of the pandemic.

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Received: April 22, 2025 Accepted: April 24, 2025

Early data from 2020 suggested that children were less susceptible to infection and generally experienced milder disease than adults. Multinational studies from Europe and China reported that 51%–62% of infected children required hospitalization, 7%–8% needed intensive care, and 4% required mechanical ventilation. Subsequently, the clinical picture evolved in tandem with emerging variants and vaccination programs. By 2021, most children (58%) exhibited only mild symptoms, and 36% remained completely asymptomatic. Following the extension of vaccination to children older than 6 months, hospitalization rates among fully immunized children fell to 0.02%–0.2% [1,2]. This progressive decrease in severity coincided with expanding population immunity and the appearance of new SARS-CoV-2 variants.

The emergence of more transmissible variants, particularly Delta and Omicron, significantly altered the epidemiological landscape for children. Global prevalence data indicated rising SARS-CoV-2 infection rates among children and adolescents, partly driven by increased adult vaccination coverage and the circulation of these highly transmissible variants [3]. The Omicron variant, in particular, displayed a distinctive pattern in pediatric populations – while it led to a substantial increase in infections and hospital admissions among children, the severity of disease was generally less pronounced than with previous variants. In the United Kingdom, during the Omicron surge from December 2021 to January 2022, infants under 1 year of age accounted for 42.2% of pediatric hospital admissions, marking a significant increase compared to earlier pandemic periods. However, data from Scotland, the United States, South Africa, and England revealed

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lower hospitalization rates with Omicron compared to Delta infections. A retrospective cohort study in the United States involving 577,938 patients found that the hospitalization risk during the Omicron period was approximately one-third of that observed during the Delta period across all pediatric age groups [4] (Table 1).

2. The suppression effect: changes in infectious disease patterns during COVID-19 restrictions

One of the most notable consequences of COVID-19 mitigation strategies was the dramatic reduction in the incidence of common childhood infections. Stringent non-pharmaceutical interventions implemented globally profoundly affected the transmission dynamics of nearly all infectious pathogens affecting children.

Invasive pneumococcal disease (IPD) exemplifies this clearly. In early 2020, IPD cases substantially declined across 26 countries. Spain experienced a 65% decrease in pediatric IPD cases in 2020 compared to the period 2018–2019. Similarly, China reported reductions in pediatric pneumococcal infections during the early pandemic period. This trend extended beyond pneumococcal disease to numerous other infections. In France, the annual incidence of community-acquired infectious diseases among children fell by one-third in 2020 relative to previous years, affecting conditions including scarlet fever, acute tonsillopharyngitis, enteroviral infections, acute bronchiolitis, and gastroenteritis [1].

Healthcare utilization patterns reflected these epidemiological changes, with pediatric emergency department visits and hospital admissions significantly declining during the

pandemic. Systematic reviews documented a 37% overall reduction in healthcare service utilization, including a 42% decrease in visits and a 28% decrease in admissions [1]. These reductions paralleled the decreased circulation of common pediatric pathogens.

The landscape for viral respiratory infections was particularly altered. Data from a large metropolitan children’s hospital indicated that before 2020, there was a median of 1,080 respiratory pathogen tests performed weekly, with positivity rates between 3.7%–4.1%. In 2020, this sharply decreased to 486 tests per week with a positivity rate of just 1.74% [5]. The suppression of respiratory viruses such as respiratory syncytial virus (RSV) and influenza was unprecedented, with seasonal peaks nearly eliminated during periods of the strictest restrictions.

3. The rebound effect: post-restriction resurgence patterns

As COVID-19 restrictions were gradually lifted, particularly following extensive vaccination campaigns, a remarkable resurgence of previously suppressed infections became evident. This rebound has manifested in several distinct patterns that challenge the conventional understanding of seasonal infectious disease epidemiology.

Researchers have identified three predominant resurgence patterns for respiratory viral infections, particularly notable with RSV:

“Off-season” pattern: This pattern involved traditionally seasonal infections emerging at atypical times of the year. For instance, countries including France, England, and Israel re-

Table 1. Comparison of the impact of COVID-19 on children across variant periods

Characteristic	Pre-Alpha/Alpha period (2020)	Delta period (2021)	Omicron period (2022–2023)
Infection rate	Lower; children less affected than adults	Increased pediatric cases; more transmissible in children	Highest pediatric rates; significant transmission in school settings
Symptom severity	51%–62% required hospital admission; 7%–8% ICU admission	Most children (58%) had mild symptoms; 36% were asymptomatic	Further reduction in severity; hospitalization risk approximately 1/3 of Delta period
Age distribution	Relatively even across pediatric age groups	Increasing cases in school-age children	Significant increase in infants < 1 year (42.2% of admissions in the United Kingdom)
Vaccination impact	No pediatric vaccine available	Vaccination began for adolescents; hospitalization rates 0.02%–0.2% in vaccinated	Extended to children > 6 months; continued protection against severe disease
Long-term sequelae	MIS-C emerged as a significant complication	MIS-C continued but better recognized and treated	Reduced MIS-C incidence; emerging concerns about post-COVID-19 conditions

COVID-19, coronavirus disease 2019; ICU, intensive care unit; MIS-C, multisystem inflammatory syndrome in children.

ported surges of RSV bronchiolitis during non-traditional seasons [1,2]. This temporal shift disrupted established clinical expectations and resource allocation models.

“See-sawing” pattern: An alternating relationship between COVID-19 and other respiratory infections became apparent. In France, Italy, the United States, and Australia, RSV outbreaks alternated with COVID-19 epidemic waves; strict restrictions during COVID-19 surges flattened RSV activity, whereas relaxed measures between waves allowed RSV resurgence [1,2].

“Upsurge” pattern: Perhaps most concerning was the observation of some infections reaching unprecedented peaks exceeding pre-pandemic levels. In Japan, RSV bronchiolitis cases rose dramatically from just 570 in 2020 to over 10,000 by mid-2021. New Zealand reported RSV incidence rates threefold higher than 2015–2019 levels following the relaxation of border restrictions in April 2021, resulting in increased hospitalizations and intensive care unit (ICU) admissions. Similarly, Australia witnessed RSV peaks surpassing median seasonal levels recorded from 2012–2019 [2].

The timing and demographic impacts of these resurgences revealed distinctive trends. In Australia, the median age of RSV-infected patients in 2020 increased to 18.4 months, significantly higher than the historical range of 7.3–12.5 months observed between 2012–2019. This shift likely reflects the increased pool of older RSV-naïve children who missed typical exposure during restriction periods. Similarly, RSV-related hospitalizations disproportionately increased among children aged 24–59 months compared to younger children, indicating delayed first infections. Resurgence patterns extended beyond RSV to other respiratory and non-respiratory pathogens. After 2 years of historically low circulation, influenza infections notably rebounded in 2022, frequently coinciding with declining SARS-CoV-2 infections. Pediatric IPD incidence also surged, with England reporting IPD incidence in 2021 (1.96/100,000) exceeding pre-pandemic levels (1.43/100,000 in 2017–2019). Germany similarly reported IPD rates surpassing average monthly values from 2015–2019 by 9% during April–June 2021 [2].

Enterovirus infections exhibited similar trajectories. France reported 3,403 hand, foot, and mouth disease (HFMD) cases from January to September 2021, marking a 47% increase compared to the same period in 2018–2019. Eighteen European countries documented rising enterovirus positivity rates, increasing from 2.5% in January to 8.2% in September 2021, with enterovirus-D68 positivity notably rising from 0.2% to

14%. Brazil experienced a significant HFMD outbreak linked to the resurgence of Coxsackievirus A6 after relaxing non-pharmaceutical interventions [2].

Another troubling development has been the increased prevalence of viral co-infections. In one Italian study, approximately 30% of respiratory infection cases involved dual viral infections, with 7% involving triple infections—rates substantially higher than those observed pre-pandemic [1,2]. This increased co-infection rate likely reflects the simultaneous circulation of multiple previously suppressed viruses (Table 2).

4. The immunity debt hypothesis: understanding the rebound

The concept of “immunity debt” has emerged as a compelling framework to explain these resurgence patterns. This hypothesis posits that reduced exposure to common pathogens during pandemic restrictions led to diminished population immunity, resulting in a larger susceptible pool and potentially more severe disease upon re-exposure (Figure 1).

Previously documented following the 2009 H1N1 influenza pandemic, this phenomenon affected RSV seasonality, initially delaying RSV epidemic onset, followed by subsequent surges in subsequent years [1,2]. The unprecedented scale and duration of COVID-19 restrictions magnified this effect across multiple pathogens simultaneously.

Children, especially those born during or shortly before the pandemic, experienced critical developmental periods without typical exposure to common pathogens essential for immune system maturation. Consequently, cohorts of immunologically naïve children became susceptible to infections typically encountered earlier in life. The observed age shift in RSV and other infections supports this hypothesis—the median age of children hospitalized with RSV increased significantly, indicating delayed first infections [2].

Immunity debt appears to have influenced not only infection incidence but also disease severity. In New Zealand, RSV-associated hospitalization and ICU admission rates were significantly elevated post-restrictions compared to historical averages [2]. This pattern suggests that delayed pathogen exposure might be linked to more severe clinical outcomes in some cases.

Table 2. Changes in pediatric infectious disease patterns across COVID-19 pandemic phases

Disease	Pre-COVID-19 (2018–2019)	During restrictions (2020)	Post-restrictions (2021–2023)
RSV bronchiolitis	Predictable winter seasonality; primarily affected infants < 12 months	Dramatic decline (> 90% reduction in many regions); minimal seasonal pattern	Off-season emergence; higher median patient age; infection rates exceeding pre-pandemic levels by up to 300%
Influenza	Annual winter epidemics; significant pediatric morbidity	Near disappearance in most regions; > 99% reduction in some countries	Delayed resurgence; alternating patterns with COVID-19; severe season in 2022–2023
Invasive pneumococcal disease	Stable endemic rates with seasonal variations	50%–65% reduction from baseline	Exceeded pre-pandemic levels in some regions; 1.96/100,000 vs. 1.43/100,000 in England
Enterovirus infections (including HFMD)	Summer-fall seasonality; stable annual rates	Very low prevalence	Large-scale outbreaks; 47% increase in France compared to 2018–2019
Multiple respiratory virus co-infections	Uncommon (< 10% of positive cases)	Rare	Increased frequency; 30% dual infections and 7% triple infections in some cohorts

COVID-19, coronavirus disease 2019; HFMD, hand, foot, and mouth disease; RSV, respiratory syncytial virus.

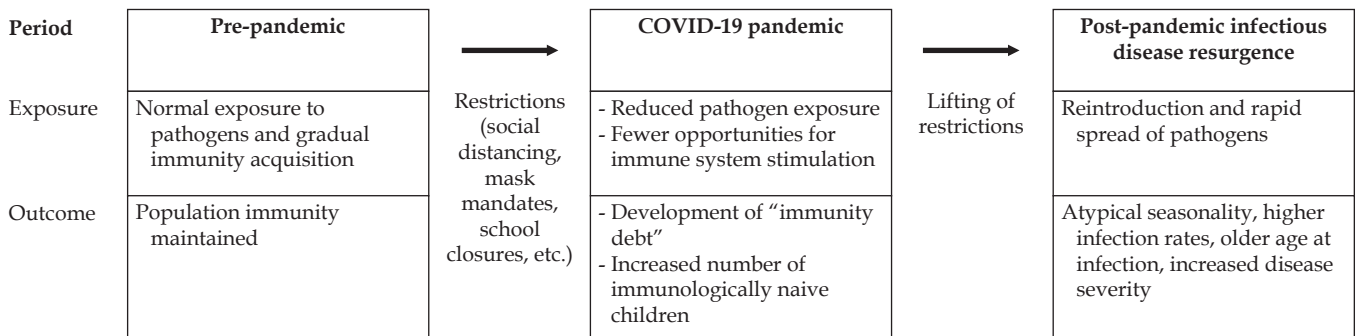


Figure 1. Proposed mechanism of “immunity debt” and post-pandemic infectious disease resurgence. The figure illustrates how pandemic restrictions reduced pathogen circulation, leading to decreased population immunity, followed by increased susceptibility and more severe disease upon re-exposure after restrictions were lifted. COVID-19, coronavirus disease 2019.

5. Current challenges and future implications

The altered landscape of pediatric infectious diseases presents several significant challenges for healthcare systems and providers. First, the asynchronous resurgence of multiple pathogens has strained healthcare resources, particularly in pediatric emergency departments and inpatient units. An analysis of pediatric emergency department census data indicated a substantial rebound in 2021 and 2022, with census peaks occurring significantly earlier than pre-pandemic trends. After the reopening of schools without mask mandates, the positivity rate for respiratory pathogens rose to 4.71%, surpassing pre-pandemic levels [5].

Second, disruptions in typical seasonal patterns have complicated clinical decision-making and resource allocation. Healthcare systems traditionally prepare for predictable sea-

sonal increases in specific illnesses, but the unpredictable timing of recent resurgences has challenged these standard approaches. The simultaneous circulation of SARS-CoV-2 alongside other resurgent pathogens has further complicated diagnostic and treatment scenarios.

Third, these patterns have exposed potential vulnerabilities in current infectious disease surveillance systems. Traditional surveillance methods based on historical seasonal patterns may be insufficient in this new epidemiological landscape. Enhanced, real-time monitoring systems are likely required to rapidly detect and respond to changing infectious disease dynamics.

The experiences of the past 3 years have also raised critical questions about finding the optimal balance of infection control measures in pediatric populations. Although COVID-19 restrictions clearly reduced short-term morbidity from vari-

ous infectious diseases, subsequent resurgence patterns highlight possible longer-term consequences of disrupted normal pathogen exposure. This introduces complex risk-benefit considerations for public health authorities contemplating infection control strategies during future epidemics.

For vulnerable pediatric populations, including children with immunocompromising conditions and transplant recipients, these shifting epidemiological patterns present unique challenges. Pediatric transplant infectious disease specialists have had to rapidly adapt to these changes [6]. The concurrent circulation of multiple respiratory viruses significantly increases risks for these groups, underscoring the need for tailored preventive strategies.

6. Preventive strategies moving forward

Navigating this changed landscape of pediatric infectious diseases requires careful consideration of several preventive strategies. Maintaining high vaccination coverage rates for both COVID-19 and routine childhood immunizations remains essential. The disruption of routine immunization services during the pandemic has heightened vulnerability to vaccine-preventable diseases, compounding concerns about immunity debt [7].

Sustained emphasis on basic infection prevention measures, particularly hand hygiene, remains crucial. Although stringent social distancing measures have largely been relaxed, selective implementation of protective measures during periods of heightened transmission could help mitigate future disease surges. In healthcare settings, diagnostic stewardship and antimicrobial stewardship have become increasingly important as infection patterns evolve [8].

Enhanced surveillance systems capable of promptly detecting shifts in disease patterns can facilitate timely and targeted interventions. Wastewater monitoring and other population-level surveillance approaches may complement traditional clinical surveillance methods [1]. For respiratory infections specifically, developing combination vaccines and therapeutics addressing multiple pathogens simultaneously could significantly assist in managing the complexities of the post-pandemic landscape.

7. Conclusion

The COVID-19 pandemic has profoundly altered pediatric infectious disease epidemiology, creating a dynamic and at

times unpredictable landscape. The direct impact of SARS-CoV-2 on children has evolved in tandem with emerging variants and vaccination uptake, while indirect effects on other infectious diseases have emerged through dramatic suppression followed by intricate resurgence patterns.

The immunity debt hypothesis offers a valuable framework for interpreting these shifts; however, many questions about the long-term implications for pediatric health remain unanswered. Navigating this evolving landscape will require flexible and responsive healthcare systems, robust surveillance infrastructures, and thoughtful implementation of preventive measures.

Clinicians caring for children must remain aware of these changed epidemiological patterns to guide diagnostic evaluations, clinical management, and anticipatory counseling effectively. The lessons learned during this pandemic period will undoubtedly influence future infection prevention and control strategies, highlighting both the intended and unintended consequences of widespread public health interventions on pediatric infectious disease epidemiology.

ARTICLE INFORMATION

Authors' contribution

All the work was done by Byung Wook Eun.

Conflict of interest

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

Funding

None.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

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Predictive factors of adolescents' happiness: a random forest analysis of the 2023 Korea Youth Risk Behavior Survey

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Received: December 14, 2024

Revised: January 12, 2025

Accepted: April 3, 2025

Purpose: This study aimed to identify predictive factors affecting adolescents' subjective happiness using data from the 2023 Korea Youth Risk Behavior Survey. A random forest model was applied to determine the strongest predictive factors, and its predictive performance was compared with traditional regression models.

Methods: Responses from a total of 44,320 students from grades 7 to 12 were analyzed. Data pre-processing involved handling missing values and selecting variables to construct an optimal dataset. The random forest model was employed for prediction, and SHAP (Shapley Additive Explanations) analysis was used to assess variable importance.

Results: The random forest model demonstrated a stable predictive performance, with an R^2 of .37. Mental and physical health factors were found to significantly affect subjective happiness. Adolescents' subjective happiness was most strongly influenced by perceived stress, perceived health, experiences of loneliness, generalized anxiety disorder, suicidal ideation, economic status, fatigue recovery from sleep, and academic performance.

Conclusion: This study highlights the utility of machine learning in identifying factors influencing adolescents' subjective happiness, addressing limitations of traditional regression approaches. These findings underscore the need for multidimensional interventions to improve mental and physical health, reduce stress and loneliness, and provide integrated support from schools and communities to enhance adolescents' subjective happiness.

Keywords: Adolescents; Happiness; Mental health; Random forest

INTRODUCTION

1. Background

Subjective happiness is an individual's subjective evaluation of their happiness and life satisfaction. High levels of subjective happiness are characterized by high levels of positive emotions and life satisfaction and low levels of negative emotions [1]. Subjective happiness is influenced by various

factors, including personality traits, ways of thinking, interpersonal relationships, and cultural and social systems [1]. In adolescents, subjective happiness is specifically affected by academic achievement, peer relationships, family dynamics, and the school environment [2]. South Korean adolescents have consistently reported the lowest levels of subjective happiness, both internationally and within Organization for Economic Cooperation and Development (OECD) countries. Subjective happiness has showed no improvement in this

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population since the early 2010s [2,3].

This phenomenon primarily stems from the educational system and socialization processes within families. South Korea tends to prioritize academic achievement over addressing the diverse developmental needs of adolescents, while parents often focus on grades and entrance exam results rather than on their children's holistic development [2,4]. According to a 2024 report by the Child Fund Korea (Korean Green Umbrella Children's Foundation), children and adolescents in South Korea experience increasing hours of extracurricular study as they progress through school grades [5]. This excessive academic burden, combined with South Korea's competitive societal atmosphere, contributes to increased depression, anxiety, and suicidal ideation among adolescents [5].

Academic burden and a competitive social atmosphere can act as additional stressors for adolescents, contributing to lower levels of subjective happiness [5]. Other stressors include educational inequalities stemming from parental income disparities, reduced sleep quality due to increased afterschool study hours, and limited peer interactions [5].

Low subjective happiness during adolescence is a multifaceted issue and can significantly impact career development, interpersonal relationship formation, and social adaptation later in life [6-9]. In particular, low happiness during adolescence may negatively affect mental health and social adaptation. This may lead to lower individual quality of life as well as higher societal costs [10].

School health teachers and community nurses play crucial preventative roles. They interact directly with adolescents on the frontline, placing them in the position to detect signs of low subjective happiness early and, when necessary, provide appropriate interventions [5]. This allows them to significantly contribute to enhancing adolescents' wellbeing. By identifying the factors that influence subjective happiness, school health teachers and community nurses can assess adolescents' mental health, provide counseling and health education, and coordinate resources across different sectors to promote positive changes in subjective happiness [5].

Existing studies on adolescents' subjective happiness have predominantly relied on traditional regression models, which present limitations in analyzing the multidimensional and complex nature of subjective happiness [11,12]. Regression models require the fulfillment of statistical assumptions regarding autocorrelation, the variance inflation factor, and multicollinearity. These constraints make it challenging to include numerous variables, limiting the ability to capture in-

tricate interactions [13]. For instance, research utilizing the Korea Youth Risk Behavior Survey to study subjective happiness in adolescents divided variables into separate models based on factors rather than analyzing all variables within a single regression model [14].

Machine-learning techniques have emerged as promising alternatives to overcome these limitations. Unlike traditional regression models, machine learning is less constrained by statistical assumptions and can effectively capture nonlinear relationships and high-dimensional interactions [15]. For example, the widely used random forest algorithm is recognized as a representative predictive model because of its robust algorithmic structure and high predictive accuracy, as demonstrated in numerous empirical studies. Ensemble methods such as random forest also facilitate variable importance analysis to identify key predictive factors influencing complex phenomena [16].

In this context, the present study applied machine learning techniques to address the limitations of traditional regression models and more comprehensively analyzed the multifaceted interactions of various factors affecting adolescents' subjective happiness. We aimed to deepen the understanding of adolescents' subjective happiness, build predictive models with greater explanatory power, and contribute to the development of effective strategies to enhance well-being in this population.

2. Research Objectives

This study analyzed the predictive factors influencing adolescents' subjective happiness using machine learning techniques. We aimed to achieve the following objectives: (1) To develop a predictive model for adolescents' subjective happiness using a random forest machine learning model for regression. (2) To analyze the predictive performance of this machine learning model and compare it with that of traditional regression models to validate the utility and explanatory power of machine learning techniques in predicting adolescents' subjective happiness. (3) To perform a variable importance analysis using the random forest machine learning model to identify the key factors that significantly influence adolescents' subjective happiness to present practical implications for improving adolescents' subjective happiness

METHODS

Ethical statements: This study is a secondary data analysis. The research plan was reviewed and approved for exemption by the Institutional Review Board (IRB) of the Gangneung-Wonju National University, as the study was determined to pose minimal risk to human subject protection and privacy (IRB no., GWNUIRB-R2024-90).

1. Study Design

This study was a secondary data analysis aimed at identifying the predictive factors for adolescents' subjective happiness using data from the 19th Korea Youth Risk Behavior Survey conducted in 2023 by the Korea Disease Control and Prevention Agency. This large-scale, cross-sectional survey was conducted nationwide to systematically assess the health behaviors of adolescents in South Korea and provide reliable and representative data. With application to this dataset, this study aimed to develop a machine learning-based predictive model of adolescents' subjective happiness. Reporting followed the guidelines outlined in Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [17]. A simplified visualization of the research design and process is presented in Supplement 1. This diagram provides an overview of the research process without detailed statistical methods.

2. Research Variables

According to previous studies, adolescents' subjective happiness is known to have complex associations with various domains, including emotional factors (e.g., depression, stress), physical activity, sleep, economic status, and family environment [2,4-9]. The 19th Korea Youth Risk Behavior Survey (2023) contains questionnaire items covering mental health, physical activity, and health behaviors. Analyzing this dataset offers the advantage of utilizing a wide range of variables that influence adolescents' subjective happiness. We analyzed 145 variables across 17 categories, including adolescents' mental health, physical activity, dietary habits, personal hygiene, substance use, and general characteristics (Supplement 2). The dependent variable, "subjective happiness perception," was measured using a 5-point Likert scale as a response to the question, "How happy do you feel in

your daily life?" All other variables were independent variables in the analysis (Supplement 2). The precise definitions of our research variables can be viewed on the Korea Disease Control and Prevention Agency website (<https://www.kdca.go.kr/yhs/>), which is publicly accessible to anyone.

3. Data Collection

The 19th Korea Youth Risk Behavior Survey (national approved statistics no., 117058) was a self-administered online questionnaire conducted nationwide from August to October 2023, targeting students from middle school (grade 1) to high school (grade 3). Eight-hundred schools were sampled, 799 schools participated in the survey, and 52,880 of 56,935 eligible students completed the survey.

4. Data Analysis

1) Exploratory data analysis

Prior to developing the random forest predictive model, an exploratory data analysis was conducted to understand the characteristics of the dataset and establish effective preprocessing strategies. Categorical variables were analyzed using frequency and percentage distributions, whereas continuous variables were examined for median, minimum, maximum, mean, and standard deviation. Data quality checks included identifying missing values, outliers, non-standard data (e.g., text or special characters), and non-response rates. This exploratory analysis provides insights into the overall structure and characteristics of the data and formed the basis for a robust data preprocessing plan.

2) Data preprocessing

The raw dataset contained observations for 52,880 participants over 145 variables before data cleaning (Supplement 2). After removing the cases with missing values, the dataset contained observations from 44,320 participants. Variables with at least 20% non-responses (35 variables) (Supplement 3) were excluded [18], leaving 115 variables in the analysis. The seven items measuring generalized anxiety disorder were summed to create a single composite variable (generalized anxiety disorder). The final dataset after data cleaning therefore included 104 variables. Missing values ('9999,' '8888') were imputed using the mode (categorical) or mean (continuous). Key variables were reverse coded for clarity (e.g., 1 was coded as 5 for subjective stress, perceived health,

economic status, and sleep quality). No additional processing required for outliers or logical inconsistencies.

3) Training and test data split

To objectively evaluate the predictive performance of the model, the entire dataset ($n=44,320$) was divided into 80% training data ($n=35,456$) and 20% test data ($n=8,864$). Additionally, five-fold cross-validation was performed to ensure model stability and generalizability of predictive performance. This process involved dividing the training data into five subsets and sequentially validating the model, preventing overfitting and enhancing the reliability of the model.

4) Random forest model

(1) Model construction

The random forest algorithm is an ensemble learning method that generates multiple decision trees and aggregates their predictions to produce a final prediction [19]. Bootstrapping is used to create multiple random training samples and aggregate the predictions of individual decision trees through majority voting or averaging to ensure prediction stability.

A key feature of the random forest algorithm is its ability to evaluate variable importance to identify the key predictors influencing the dependent variable [19]. This is obtained by calculating the relative importance of independent variables based on the degree of impurity reduction at each decision tree node. Additionally, by combining multiple decision trees, random forest prevents the overfitting of individual trees and reduces prediction variability.

To enhance the model performance, optimization techniques such as hyperparameter tuning were applied. This process improved the prediction accuracy, facilitating the precise identification of significant variables affecting adolescents' subjective happiness.

(2) Hyperparameter configuration

Hyperparameters are key parameters that control the learning process of a machine-learning model and must be defined by the researcher before training. Determining the optimal combination of these hyperparameters is a critical step in determining the performance of the model [20].

In this study, the hyperparameter tuning was performed using the random search method. Combinations of hyperparameters were selected at random within a specified range and tested to identify a configuration that strikes a balance

between computational efficiency and optimization performance [20]. The hyperparameter values and their impact on the model are detailed in [Supplement 4](#).

5) Model evaluation

(1) Performance metrics

This study utilized performance metrics such as mean squared error (MSE), mean absolute error (MAE), root mean squared error (RMSE), and the coefficients of determination (R^2 and adjusted R^2) to evaluate predictive performance. Among these, MSE, MAE, and RMSE reflect the absolute magnitude of prediction errors. However, their values have no upper bound, making direct comparisons between models less intuitive. Therefore, this study primarily evaluated and interpreted model performance using R^2 , which standardizes the model's explanatory power to a scale between 0 and 1.

(2) Shapley Additive Explanations

Shapley Additive Explanations (SHAP) is a tool to interpret machine learning models utilizing Shapley values from game theory. The impact of each feature on the predictions is quantified using a SHAP value, where the sign of the SHAP value indicates whether the feature contributes to an increase (positive) or decrease (negative) in the predicted value. In this study, key predictive variables were selected using an elbow plot of the SHAP value distribution. Variables were added to incrementally to evaluate their contributions [21]. The results showed a negligible performance improvement when more than eight variables were included. At feature index 8, the mean SHAP value converged to zero. Thus, the eight features with the highest SHAP values were identified as the key predictors that significantly influenced adolescents' subjective happiness ([Figure 1](#)).

RESULTS

1. Predictive Performance

For the training data (five-fold cross-validation), the metrics were: MSE, 0.57; 95% confidence interval (CI), 0.56–0.58; RMSE, 0.76; 95% CI, 0.75–0.76; MAE, 0.61; 95% CI, 0.60–0.61; and R^2 , .39; 95% CI, .38–.40. For the test data, the metrics were MSE (0.57), RMSE (0.76), MAE (0.61), R^2 (.37), and adjusted R^2 (.37). The model performed similarly across the training

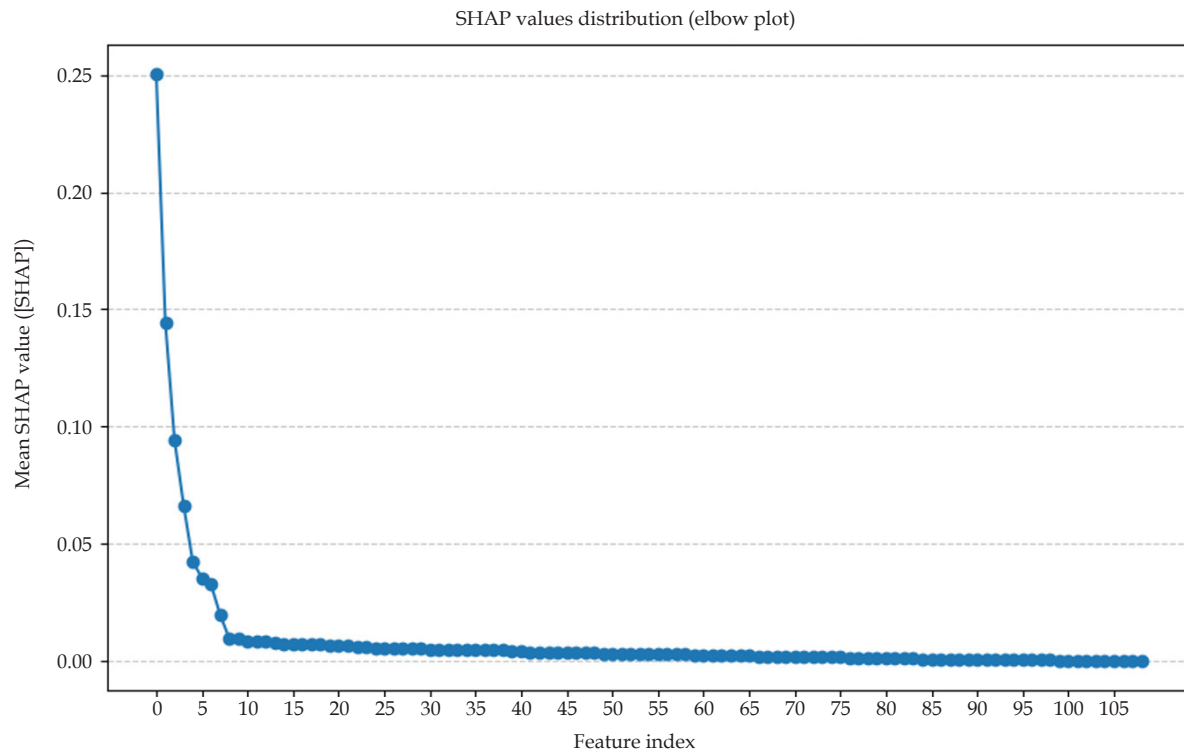


Figure 1. Shapley Additive Explanations (SHAP) values distribution (elbow plot). The elbow plot illustrates the mean absolute SHAP values from the Random Forest model, highlighting the contribution of each feature to the model predictions. The x-axis represents the feature index (ranked by importance) and the y-axis represents the mean SHAP value. A sharp decline in the SHAP values beyond the 8th feature indicates that the most influential predictors of the dependent variable were concentrated within the top eight features, whereas the remaining variables contributed minimally.

and test datasets, indicating that it stably predicted adolescents' subjective happiness without overfitting. The model explained approximately 37%–39% of the total variance in subjective happiness (Tables 1, 2). This explanatory power may seem modest, given the multifaceted nature of adolescents' subjective happiness. However, this finding provides empirical evidence for the feasibility of leveraging machine learning to capture the interplay of diverse psychosocial, physical, and socioeconomic factors more effectively than traditional regression models. Although subjective happiness is shaped by a complex interplay of influences, a data-driven approach such as random forest can robustly identify and predict a substantial portion of the variance within a large, nationally representative sample.

2. SHAP Analysis

1) SHAP summary plot

The SHAP analysis identified eight key predictors influencing adolescents' subjective happiness, ranked by impact: perceived stress (Supplement 5), perceived health, experience

of loneliness, generalized anxiety disorder, suicidal ideation, economic status, fatigue recovery through sleep, and academic performance.

The feature impact plot also reveals the directional effects of each variable. For instance, higher perceived stress levels have a negative impact on subjective happiness, whereas better perceived health positively influences it. These findings indicate that adolescents' subjective happiness is shaped by a complex interplay of factors, including mental health (e.g., perceived stress), physical health (e.g., perceived health), and socioeconomic status (e.g., economic status). Stress, loneliness, anxiety, and suicidal ideation were found to consistently undermine subjective happiness, whereas stronger perceived health, sufficient sleep, better economic status, and better academic performance were associated with more positive self-evaluations of happiness.

2) SHAP force plot

The SHAP force plot revealed a complex interplay of various factors influencing subjective happiness levels (Figure 3).

For adolescents with very low subjective happiness (1.34),

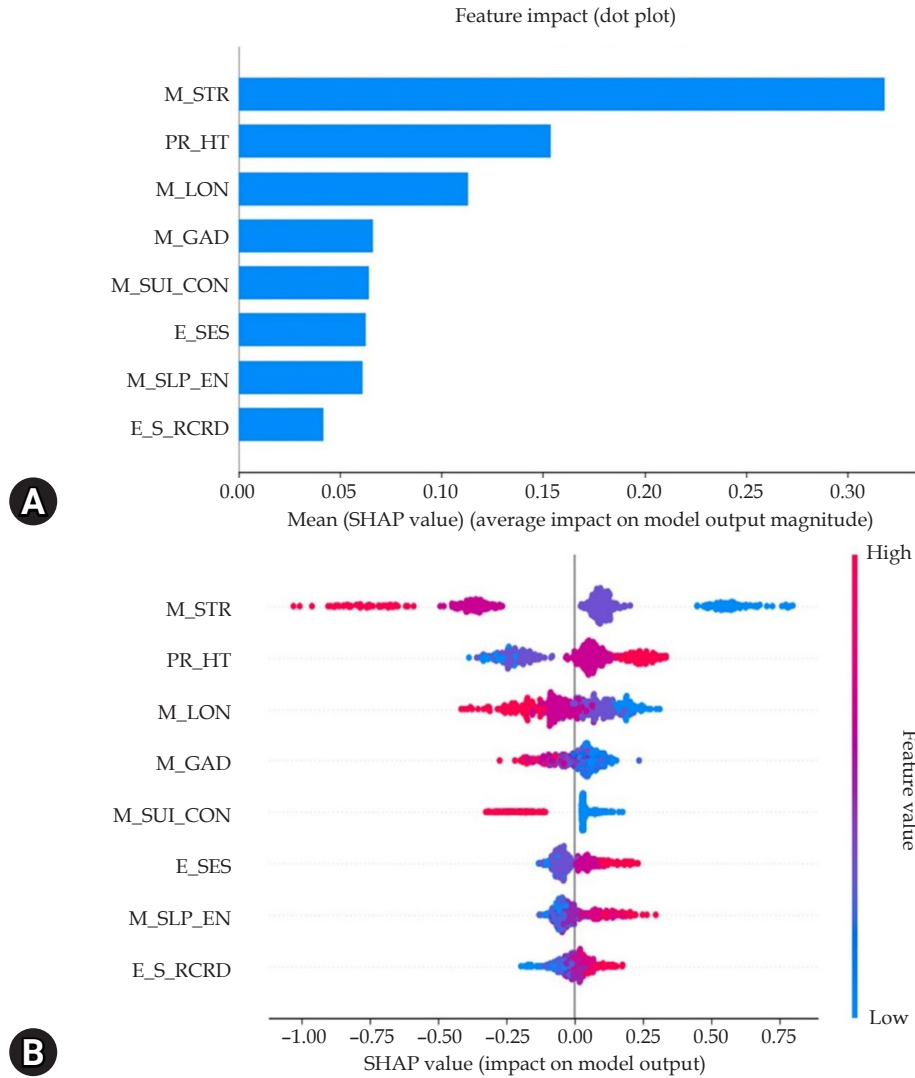


Figure 2. Shapley Additive Explanations (SHAP) values. The SHAP bar plot illustrates the ranking of key predictors of the dependent variable. The features appearing at the top were the most influential in predicting subjective happiness. The SHAP summary plot provides insights into the influence of independent variables on the dependent variable. A positive SHAP value indicates a positive contribution to subjective happiness, whereas a negative SHAP value suggests a negative impact. The feature values are color-coded; low feature values are represented in blue, whereas high feature values are shown in red. For example, lower levels of perceived stress (M_STR) were associated with higher subjective happiness, as indicated by positive SHAP values. E-SES, economic status; E_S_RCRD, academic performance; M_GAD, generalized anxiety disorder scale; M_LON, experience of loneliness; M_SLP_EN, degree of fatigue recovery through sleep; M_STR, perceived stress in daily life; M_SUI_CON, suicidal thoughts; PR_HT, perceived health status.

Table 1. Configuration of the random forest model (N=44,320)

Random forest model configuration and performance	Results
bootstrap	True
max_depth	20
min_sample_leaf	8
min_samples_split	2
n_estimators	500
max_features	None
random_state	42
Cross-validation	5

the strongest influences were extremely high perceived stress (5.0), a severe experience of loneliness (5.0), very poor perceived health (1.0), suicidal ideation (1.0), and high levels of generalized anxiety (26.0).

At a low subjective happiness level (2.03), moderate fatigue recovery through sleep (3.0) had a positive effect. However, its impact was outweighed by extremely high perceived stress (5.0), a severe experience of loneliness (5.0), suicidal ideation (1.0), moderate perceived health (3.0), and high lev-

Table 2. Performance of the random forest model

	MSE (95% CI)	MAE (95% CI)	RMSE (95% CI)	R ² (95% CI)	Adjusted R ²
Train data	0.58 (0.57–0.59)	0.61 (0.60–0.62)	0.76 (0.75–0.77)	.38 (.37–.39)	-
Test data	0.57	0.61	0.76	.37	.37

CI, confidence interval; MAE, mean absolute error; MSE, mean squared error; RMSE, root mean squared error.

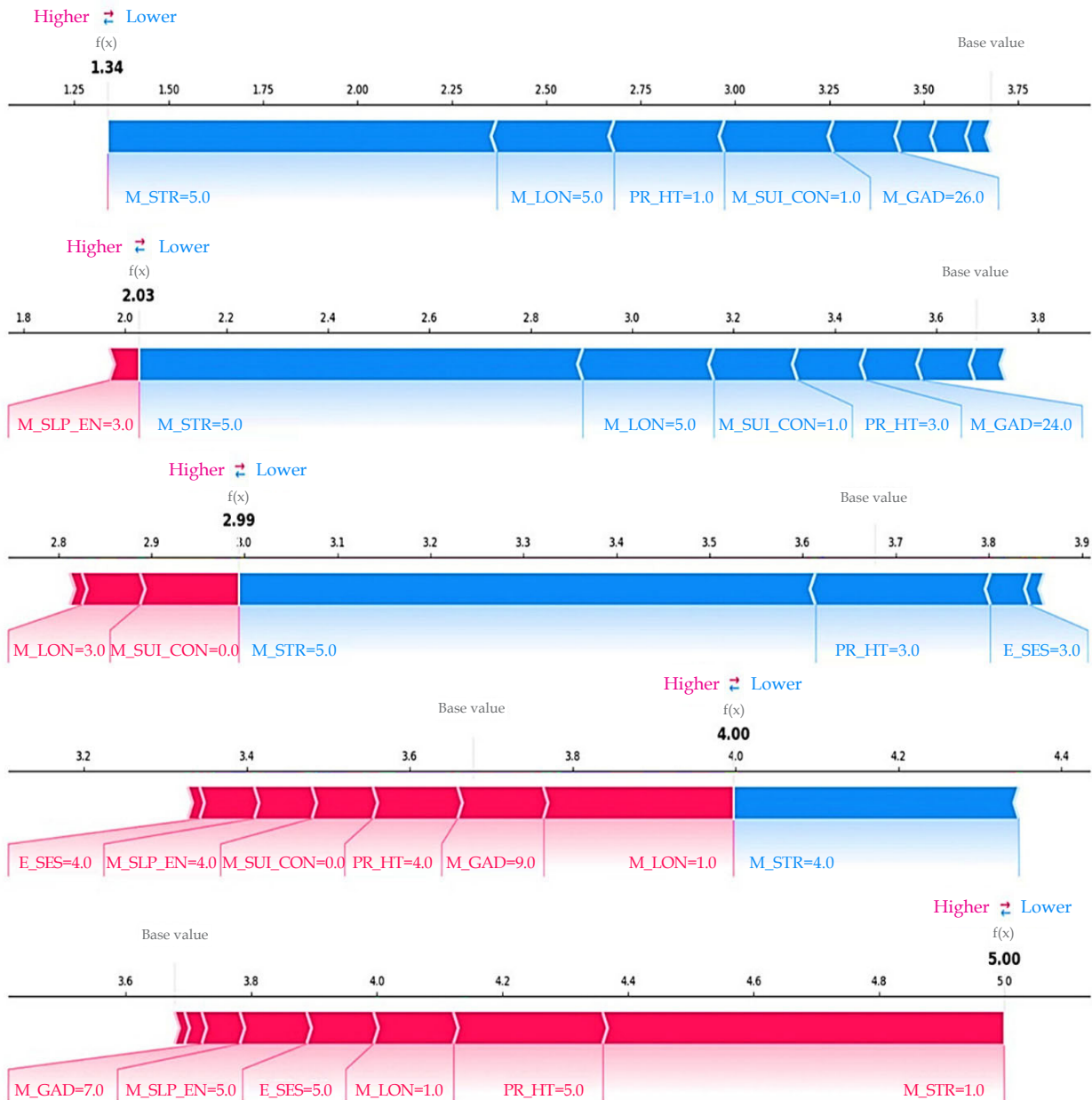


Figure 3. Shapley Additive Explanations (SHAP) force plot. The waterfall plot visualizes the impact of individual features on the model predictions using the SHAP values. Each row represents a single prediction instance with features contributing positively (red) or negatively (blue) to the predicted outcome. The x-axis represents the model output ($f(x)$) starting from the base value, and the colored bars show how each feature shifts the prediction. Red bars indicate features that increased the predicted value, contributing positively to subjective happiness. The blue bars indicate the features that decreased the predicted value and contributed negatively. Features with higher SHAP values (larger bars) had a more significant influence on the model prediction. E-SES, economic status; E_S_RCRD, academic performance; M_GAD, generalized anxiety disorder scale; M_LON, experience of loneliness; M_SLP_EN, degree of fatigue recovery through sleep; M_STR, perceived stress in daily life; M_SUI_CON, suicidal thoughts; PR_HT, perceived health status.

els of generalized anxiety (24.0).

Moderate subjective happiness (2.99) was positively influenced by a moderate experience of loneliness (3.0) and no suicidal ideation (0.0), whereas extremely high perceived stress (5.0) had a negative effect. Moderate perceived health (3.0) and economic status (3.0) has a positive influence.

High subjective happiness (4.00) was predominantly driven by positive factors including high economic status (4.0), sufficient fatigue recovery through sleep (4.0), no suicidal ideation (0.0), good perceived health (4.0), low levels of generalized anxiety (9.0), and a low experience of loneliness (1.0). Only moderately high perceived stress (4.0) had a negative influence.

For very high subjective happiness (5.00), all the major predictive factors consistently contributed positively. These included low levels of generalized anxiety (7.0), very sufficient fatigue recovery through sleep (5.0), very high economic status (5.0), a low experience of loneliness (1.0), excellent perceived health (5.0), and very low perceived stress (1.0).

Collectively, these findings illustrate that adolescents' subjective happiness is governed by an intricate web of psychosocial and physical resources, mental health conditions, and academic and economic contexts. Notably, stress, anxiety, loneliness, and suicidal ideation substantially decreased subjective happiness levels, emphasizing the urgency of mental health interventions at school and community levels. Similarly, stronger perceived health, better economic status, and sufficient fatigue recovery through sleep were highlighted as factors that can bolster adolescents' well-being. Random forest can capture these simultaneous influences with relatively high stability, reinforcing the idea that an integrated approach, combining mental health screening, promotion of physical health, and attention to socioeconomic disparities, can systematically address the complexity adolescents' subjective happiness. The findings of the present model provide quantifiable support for the proposition that schools, health professionals, and policymakers should collaborate across multiple dimensions to design programs targeting stress, sleep quality, and mental health, given their influential roles in shaping how young people evaluate their lives.

DISCUSSION

This study employed random forest and SHAP analysis to investigate the key predictors of subjective happiness among South Korean adolescents, using data from the 19th Korea

Youth Risk Behavior Survey (2023). This survey produced a robust dataset capturing a wide range of health behaviors and psychosocial factors among adolescents nationwide [5]. Happiness, as conceptualized in this research, is a universal aspiration subject to cultural, social, and individual variations in its definition [1]. Subjective happiness, in particular, concerns one's evaluation of one's own life, encompassing emotional (positive and negative affect) and cognitive (life satisfaction) components. For this reason, understanding the drivers of subjective happiness requires considering a diverse set of predictive factors [1,22].

Compared with prior studies that mostly used linear regression models [9,14], the machine learning approach in this study facilitated a more detailed examination of complex, nonlinear interactions among variables. In keeping with the comprehensive scope of the survey, our findings identified eight primary predictors of adolescents' subjective happiness: perceived stress, perceived health, experiences of loneliness, generalized anxiety disorder, suicidal ideation, economic status, fatigue recovery through sleep, and academic performance. This aligns with the notion that adolescents' subjective happiness is shaped by the intricate interplay of mental, physical, and social influences.

Importantly, the application of random forest and SHAP methods provides new insights into adolescent subjective happiness. Traditional regression models often struggle to capture nonlinearities and high-dimensional interactions among numerous variables [11,12]. In contrast, random forest can robustly handle such complexities. SHAP analysis provides an interpretable framework to isolate the individual contributions of each predictor. By unveiling how each factor, such as stress, sleep, or economic status, exerts its impact in different contexts, SHAP analysis of the random forest model offers a richer understanding of where targeted interventions may have the greatest effect. Consequently, alongside identifying key predictors of subjective happiness, this study deepens the contextual understanding of how these predictors interact to shape this outcome.

In particular, adolescents experiencing low levels of subjective happiness appear to be burdened by overlapping negative factors, such as high perceived stress, experiences of loneliness, poor perceived health, suicidal ideation, and high levels of generalized anxiety. Stress and loneliness, often intensified by academic pressure, conflicts with peers, or limited emotional support, have been consistently linked to lower subjective happiness [23]. Suicidal ideation reflects severe

psychological distress, and can stem from depression, hopelessness, and low self-esteem [24]. Anxiety is known to compound mental and physical strain, and this effect potentially involves physiological mechanisms such as elevated cortisol levels [25]. Even among those with low subjective happiness, better sleep providing greater fatigue recovery had a modest positive effect on subjective happiness, although a persistent lack of adequate rest exacerbates mental health concerns and impedes recovery [26,27]. Without timely and comprehensive support, these compounding factors may seriously threaten the psychosocial development of adolescents.

In contrast, the SHAP force plot revealed that adolescents with high subjective happiness benefited from various protective elements, including sufficient fatigue recovery through sleep, good perceived health, low experiences of loneliness, the absence of suicidal ideation, and low levels of generalized anxiety. These factors promote emotional stability and physical well-being. Additionally, higher economic status helps mitigate financial stress and enhance subjective happiness [27-29]. Academic performance may create a sense of competence, thereby offsetting the stress associated with unsatisfactory grades [9]. Given the importance of economic status in shaping adolescents' subjective happiness observed in this study, it may be valuable to consider policy-level interventions that support economically disadvantaged youths. Programs such as tuition subsidies, access to afterschool programs, and community welfare services could help alleviate financial stress and create more equitable environments that promote adolescent well-being.

Although these findings identify individual and environmental protective factors, contextual influences, such as family dynamics and cultural norms, can still shape the interplay between these variables.

Overall, our results demonstrate that adolescents' subjective happiness in South Korea emerges from a constellation of factors, including mental health conditions (stress, loneliness, anxiety, and suicidal ideation), physical well-being (fatigue recovery through sleep and perceived health), and socioeconomic circumstances (economic status). Consequently, a dynamic and integrated approach spanning mental health screening, stress management programs, social support enhancements, and physical health initiatives offers a more holistic means to promote adolescents' subjective happiness. Schools, community nurses, and policymakers should work together to improve sleep hygiene education, provide targeted counseling on stress and loneliness, and address socioeco-

nomnic disparities. Through efforts to simultaneously reduce negative stressors and strengthen protective factors, adolescents' subjective happiness can be nurtured more effectively.

Nevertheless, because the data analyzed in this study is cross-sectional and observational, we cannot definitively establish causal relationships among the identified predictors. Future longitudinal studies or experimental designs are necessary to clarify the causal pathways and strengthen the evidence base for targeted interventions based on these factors.

Finally, although the analyzed dataset is both large and nationally representative, caution should be exercised when generalizing these findings to other cultural contexts [22]. Future research could expand to different populations and develop machine learning models tailored to specific subgroups (e.g., by sex or school level). This may improve predictive precision and reveal further details about the complex factors underlying adolescents' subjective happiness.

By illustrating the interplay between psychosocial and physical factors, this study reaffirms that adolescents' subjective happiness cannot be reduced to a single dimension such as academic performance. The capacity of random forest and SHAP analysis to capture these multidimensional nonlinear relationships highlights the importance of data-driven strategies that address the broad determinants of adolescents' lives, ultimately supporting more effective interventions to promote subjective happiness.

Conclusion

This study employed a random forest model with SHAP analysis to explore multiple factors influencing adolescents' subjective happiness using data from the 19th Korea Youth Risk Behavior Survey (2023). Subjective stress, perceived health, experience of loneliness, generalized anxiety disorder, suicidal ideation, economic status, fatigue, recovery through sleep, and academic performance were identified as meaningful contributors to adolescents' subjective happiness.

A notable strength of this study is its focus on a broad range of psychosocial and health-related variables within a large, nationally representative sample. Using machine learning, this study captured complex interactions among variables, and the SHAP analysis offered more specific insights into how each factor affects subjective happiness.

These findings highlight the interplay between the mental, physical, and socioeconomic factors that shape adolescents' subjective happiness. Future research should build on this

work by examining causal pathways through longitudinal designs or by extending the analysis to different cultural contexts. Such efforts may help to refine our understanding of adolescents' subjective happiness and inform more precise strategies to address this population's complex needs.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: EJK, SKK, SHJ, YSR. Data collection: SKK, SHJ. Formal analysis: EJK, SKK. Interpretation of data: SKK, YSR. Writing-original draft: EJK, SKK, SHJ, YSR. Writing-review and editing: SKK, SHJ, YSR. Final approval of published version: EJK, SKK, SHJ, YSR.

Conflict of interest

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

Funding

This study was supported by a National Research Foundation of Korea (NRF) grant funded by the Korean government (No. 2021R1A2C1095530).

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

Supplementary material

Supplement 1. Overview of study methodology.
Supplement 2. Overview of key variables.
Supplement 3. Summary of omitted variables.
Supplement 4. Description of key hyperparameters.
Supplement 5. Frequency analysis and chi-square test for differences in subjective stress causes by adolescents' subjective happiness levels.

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Happiness experiences among South Korean elementary school students receiving local children's center services: a qualitative study using Giorgi's phenomenological method

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Received: November 28, 2024

Revised: January 8, 2025

Accepted: April 3, 2025

Purpose: The role of local children's centers is becoming more important as after-school care expands to South Korean elementary schools. As elementary school years are the time when children grow into healthy adults. Children in this period must grow with a feeling of happiness. The purpose of this study is to understand and explain the meaning of happiness experiences of elementary school students receiving community child care services, and to expand and apply nursing knowledge to child care at community child care centers through their happiness experiences.

Methods: This qualitative study was conducted with 21 elementary school students who received program services at local children's centers for more than 1 year. Participants conducted 1:1 depth interview. The interviews were analyzed by dividing them into themes.

Results: Finally, five themes and 14 sub-themes were organized. The five themes were derived as "feeling of freedom and joy," "healthy and pleasant feeling from being cared for," "feeling smart and competent," "feeling loved by someone special," "feeling well-adjusted to school life." This conclusion means that participants experience autonomy and enjoyment in daycare centers, positive care, strengthen emotional bonds, and help them adapt well to school.

Conclusion: The participants in this study expressed happiness in various meanings at local children's centers. This thesis informed that it is important for local children's centers to prioritize children's happiness for education and care for children. This paper will contribute to society by presenting a nursing perspective on the development of community children's centers.

Keywords: Child; Community health services; Giorgi; Happiness; Qualitative research; School-age

INTRODUCTION

As of 2022, there were 4,295 local children's centers in South Korea, and the number has steadily increased every year. The number of children receiving care in these centers is 106,745 [1]. The goal of these local children's centers is to

provide a social safety net for children and offer protection, education, wholesome play, and comprehensive welfare services to promote positive school adaptation [2]. According to the Ministry of Gender Equality and Family, more than 80% of the personnel at each local children's center lack the capacity to meet children's care needs. The children utilizing these

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centers mainly come from single-parent families, low-income households, dual-income families, and multicultural families. As such, these centers provide learning opportunities, entertainment, and various programs for underserved children in the community [3]. Local children's centers are typically open 9–10 hours a day. Most centers operate from 10 AM to 7 PM, with some closing as late as 10 PM when necessary [4]. This means that children who receive local children's center services spend a significant amount of time at the centers compared to home.

The reduction in family size and increased participation of married women in working society have highlighted the need for childcare to need for childcare to be a shared social responsibility [5]. To address this issue, South Korea has been planning to establish a "Comprehensive Care System" since 2018 [6]. Parents have asked that schools extend care hours and requested that local children's centers participate more actively in childcare. About 30% of the parents requested extended care hours [7].

Happiness is an important purpose in all phases of life and is the best choice an individual can make. Human beings achieve happiness and self-actualization through wise and autonomous choices. Children in South Korea, however, have low levels of happiness and satisfaction with life, with this dissatisfaction decreasing even more over time. In fact, the happiness of elementary school students in South Korea is the lowest among Organization for Economic Cooperation and Development (OECD) countries [8]. Studies show that children are happier when parents have warm, positive parenting attitudes and are supportive of their autonomy [9]. Children who have stable relationships with their parents and receive positive support experience a sense of well-being and can positively design their future. The more social support provided, the higher the child's sense of happiness [8]. Unfortunately, children who use local children's centers due to their caregiver's circumstances inevitably lose time spent at home with their parents. In the case of children who need to use local children's centers, a lack of time to talk with their parents at home is inevitable due to the situation of their caregivers, such as their parents' economic activities, multicultural families, single parents, and lack of time. Children who experience positive support and stable relationship with their parents experience a sense of well-being and are able to design their future in a positive way. The more social support is provided, the higher the child's sense of happiness [8].

The elementary school years are crucial for the develop-

ment of prosocial behavior and social development in children [10]. These years are a time when prosocial behavior development occurs. It is an important time for a child's social development [11]. The development of social-emotional competencies during the elementary years leads to better relationships with peers, higher levels of school life, and positive impacts on daily life [12]. Stress experienced during this period negatively affects physical and psychological health [13], with psychosocial stress posing a risk factor for individual psychosis [14]. Children attending local children's centers experience more daily life stress than those from general households [15]. While enhancing academic achievement in elementary school is important, it is equally crucial to focus on emotional and social growth, learning appropriate behavior control, and mastering the art of waiting [16].

Globally, local children's centers experience safety challenges faced by teachers and a lack of data on children outside of school. There is also a shortage of educational and recreational facilities for children [17]. Among elementary school children using local children's centers, some are in the lower 30% of academic ability and potentially at risk for learning disabilities [18]. Currently, South Korea operates basic programs, such as protection and education at local children's centers, as well as specialized programs, such as weekend, holiday, and nighttime care programs [1]. This trend means a reduction in the time children spend with their parents, implying that the time previously spent with family at home is now spent at local children's centers.

Studies on the rights of children at local children's centers [2], stigma [4], childcare systems and improvement plans [6], elementary students' well-being and prosociality [10], and the effectiveness of social-emotional learning [12] are being actively conducted. However, in previous studies, there are many quantitative studies such as the effects of learning and measures to improve the system. Above all, there are few papers on the practical experiences of elementary school students that can be recognized through qualitative research. Research on how elementary school students spend their time after school, what life is like at local children's centers, and their experience of happiness there is lacking. Therefore, it is necessary to understand the happiness experiences of elementary school students using local children's centers and the meaning of those experiences. Qualitative studies are appropriate for understanding the nature of these experiences. This study employed the qualitative research method by Giorgi [19] to understand elementary students' experience of

happiness at local children's centers.

The purpose of this study was to understand the happiness experiences of children who use local children's centers and to identify the essence of happiness experiences. And the results of this study will provide a nursing perspective to improve the happiness of children using local children's centers. This can satisfy the social demand to provide basic data necessary for the operation and education of local children's centers.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Jeonju University (IRB No. JJIRB-2023-0607). Informed consent was obtained from all participants.

1. Study design

This study employed the phenomenological method by Giorgi [19]. The research method by Giorgi [19] is a descriptive phenomenological study based on Husserl's transcendental phenomenology. The Giorgi method avoids the researcher's interpretation as much as possible and adheres to the description of the individual's subjective experience, making it suitable for this study with children [19]. Since the adult researcher may risk interpreting the participating children's experiences from an adult perspective, the method by Giorgi [19] is appropriate as it maintains epoché and derives the essence of experiences as they are. The psychological phenomenological experiential research by Giorgi [19] involves suspending empirical judgments, identifying the structure of individual experiences, freely varying the aspects of individual experiences, grasping the essential structure of experiences, and describing the basic structure. The reporting of this study followed the guidelines outlined in the SRQR (Standards for Reporting Qualitative Research) reporting guidelines.

2. Setting and Participants

The research setting included two community children's centers in South Korea. After informing the centers about the research, consent was obtained from the parents of elementary school students who expressed willingness to participate. Through purposive selection of participants, a total of 21 par-

ticipants were selected.

Participants in the study were elementary school students who had received services from local children's centers for more than a year, and they vividly expressed the happiness they experienced at local children's centers in their own language.

The researcher has 20 years of experience in qualitative research and is a regular member of the Society for Qualitative Research. The researcher reviews qualitative papers every year and participates in qualitative conferences. The researcher has been running a program once a week at the children's center for 3 years and counseling children at the children's center. And this researcher has been volunteering and counseling at the local children's center once a week for 2 years. Therefore, there is a sense of trust and friendliness between the researcher and the participants. In the course of my volunteer work, I became interested in the well-being of children who receive services from the local children's center.

3. Data Collection

Data collection took place over 3 months, from December 5, 2023, to February 19, 2024. The study participants were recruited with the help of the manager of the local children's center, and the children's consent was obtained. Consent was then sought in writing from the parents of the children whose consent was obtained. When the researcher received the consent form for the study from the participating children and their parents, they informed them in advance about the interview questions.

The interview took place in the interview room of the local children's center. The interviews were one-on-one, and each child was interviewed 2–3 times. Each interview took 30–40 minutes. The gender of the researcher was female, and when interviewing male children, two children were interviewed at the same time instead of a one-on-one interview. The interviews were recorded with the consent of both the participants and their guardians. After the interviews, the recordings were repeatedly listened to and transcribed verbatim. Non-verbal expressions and the characteristics of the participants were also noted. After the final interview, the transcribed content was summarized and reviewed with the participants to ensure the accuracy of the interview content.

The semi-structured questions by Kvale [20] in 1998 used in this study were as follows. The introductory questions included, "How did you come to use the local children's cen-

ter?" with follow-up questions, "What is the most memorable thing about living at the local children's center?" and "What is life like at the local children's center?" and specific questions, such as, "What makes you happy about living at the local children's center?" and "What is happiness for the participants?" and interpretive questions, such as, "How has living at the local children's center made a difference to you?" Appropriate silence was used during the interview. Finally, responses to key interview questions were analyzed by identifying common semantic units related to participants' happiness experiences and incorporating the collected data accordingly.

4. Data Analysis

Data analysis followed the analysis procedure by Giorgi [19]. The recorded and transcribed data were read to produce an outline. The entire content was then divided into meaning units. Common meaning units were identified among the participants and categorized. These common meaning units were re-integrated, summarized into new meaning units, and translated into the researcher's language. Finally, the structure of the experiences was integrated based on the transformed meaning units. The researcher went through an open-ended and circular thinking process to exclude preconceived notions, whether the child did not over-reflect subjective biases, whether he really grasped what the child was trying to express, and continuously reasoned, reflected, and questioned over time. The researcher had a researcher with 15 years of qualitative research experience to test the interpretation results of this paper from multiple angles so that the interpretation process of the research results could be improved.

The researchers could clarify that meaning units were determined by reading the participants' statements and segmenting the text where a shift in meaning was detected. The detailed steps of the data analysis by Giorgi [19] used in this study were:

Step 1: The collected data were read repeatedly, and the participants' overall perception of their happiness experiences was ascertained.

Step 2: Content changes in the collected data were separated. In this process, "epoché" was used.

Step 3: Phenomenological reduction was used as a process of transforming the unit of meaning into an academ-

ic expression in a description of the participants' experience of happiness.

Step 4: In the final stage, a transformation of the "free variation" was required to find the essence of the participants' experience of happiness. This was integrated into the structure.

5. Trustworthiness

The evaluation criteria of credibility, dependability, transferability, and conformability of Lincoln and Guba [21] were employed to enhance the study's rigor. First to confirm credibility, the words and facial expressions of the participants were presented as quotes. Second, bracketing and the suspension of judgment were used to maintain dependability. And an analytical memo from the researcher was included. Third, data were saturated in the experiences of community child centers until no new data emerged to ensure transferability. Fourth for conformability, the entire research process was made transparent to the participants, and the interpretations were verified with the participants before being used as data.

This researcher has published several phenomenological studies over 20 years and is an active member of academic societies related to qualitative research. She is constantly active in workshops and conferences on qualitative research.

RESULTS

1. Characteristics of the Participants

After recruiting the participants, a total of 21 participated in the study, and none were eliminated. The general characteristics of the participants were 13 males (61.9%) and eight females (38.9%). The participants included two first graders, two second graders, six third graders, three fourth graders, five fifth graders, and three sixth graders. In the local children's center, there are six children who participated in 1 year, seven children who participated in 3 years, one child who participated in 4 years, and two children who participated in 5 years. The average participation period was 2.3 years. Among the participants, 12 (57.1%) were latchkey children and 4 (42.8%) were from working-class families. There were five single-parent families (23.8%) and 7 (33.3%) were multicultural families. The characteristics of the participants are shown in Table 1. By analyzing the responses collected through individual in-depth interviews, five themes and 14

Table 1. General characteristics of the participants (N=21)

No.	Sex	Primary-school grade	Center-durable years	Latchkey parent	Single-parents	Multicultural family
1	M	1	1	O	X	O
2	M	1	1	X	X	X
3	F	2	1	O	X	X
4	M	2	2	X	X	X
5	F	3	2	O	O	O
6	M	3	1	O	X	X
7	M	3	2	X	X	O
8	F	3	1	O	O	X
9	M	3	2	O	X	X
10	M	3	3	O	X	X
11	M	4	3	O	X	O
12	F	4	2	X	X	X
13	F	4	1	X	X	X
14	F	5	3	O	O	X
15	M	5	2	X	O	O
16	F	5	2	O	O	X
17	M	5	3	O	X	O
18	M	5	3	O	X	O
19	M	6	4	X	X	X
20	M	6	5	X	X	X
21	F	6	5	X	X	X

M, male; F, female.

sub-themes were identified. The thematic analysis of the happiness experiences of elementary school students who participated in the local children’s centers in Korea follows.

2. Data Analysis Results

Finally, five themes and 14 sub-themes were derived as a result of the study. The contents of themes and sub-themes are shown in [Table 2](#).

1) Theme 1: feeling of freedom and joy

The participants felt that the community children’s center made them happy and enjoyed participating in many programs. They promoted their physical and emotional growth in their freedom.

(1) Sub-theme 1: respecting individual freedom rather than imposing discipline

The participants felt happy with the policies of the local children’s centers that gave children freedom rather than forcing regulations.

“There is no homework at the children’s center, so I don’t feel burdened.” (Participant 12)

“I feel like I’m coming to play when I come to the children’s center.” (Participant 17)

“There are many rules at school. There are no such rules here. I come whenever I want, and even if I come late, the teacher doesn’t scold me.” (Participant 19)

(2) Sub-theme 2: participated in fun activities at local children’s center

The participants preferred playing to studying at the children’s center. They engaged in various play activities and found joy in them.

“I am just happy when I play.” (Participant 2)

“I play a lot of soccer. Soccer at the children’s center is fun.” (Participant 6)

“I learned magic. I want to become popular at school by learning magic well.” (Participant 8)

“I like going outside to play jump rope. The teachers come out and watch, too.” (Participant 13)

(3) Sub-theme 3: making a lot of friends

The participants liked playing at the children’s center. They engaged in various activities, planned their future, and found joy in playing and activities.

“I have two friends at school. Here, I have seven friends. So, I like it here better.” (Participant 4)

“School friends go to academies after school. I don’t go

Table 2. Analysis of the meaning of happiness in South-Korean elementary school students receiving local children’s center service

Clusters	Sub-clusters
Feeling of freedom and joy	Respecting individual freedom rather than imposing discipline Participated in fun activities at local children’s center Making a lot of friends
Healthy and pleasant feeling from being cared for	Taking care of me when my family was away A teacher’s care when I’m sick Enjoyment that delicious food freely
Feeling smart and competent	Helping me with my school assignments and teaching me what I’m lacking Improvement in school performance Feeling a sense of accomplishment through local children’s center programs
Feeling loved by someone special	Consultation and care when I’m in trouble To be praised by my teacher
Feeling well-adjusted to school life	Helping prepare for my school life Make friends and get closer Living a regular and restrained life

to an academy, so I can’t play with them.” (Participant 10)
 “I like friends here because we play together every day.” (Participant 12)

2) Theme 2: healthy and pleasant feeling from being cared for

The participants felt that the community children’s center served as the guardian. They hated going home right after school to empty houses. The community children’s center protected the children both physically and mentally by providing meals when they were sick. During those times, the children were happy.

(1) Sub-theme 1: taking care of me when my family were away

The participants could have dinner and snacks at the children’s center during the school term and all meals during vacations. Almost every day, when they returned home, their parents were absent due to work, or if they were home, they did not provide meals.

“When I go home, my mom is not there. She comes home when I’m asleep. I am not scared, but I feel lonely. I don’t like this situation.” (Participant 4)
 “I spend most of the day at the center and go home late because no one is at home. I do my homework here... Sometimes the teacher takes me home.” (Participant 9)

(2) Sub-theme 2: a teacher’s care when I’m sick

The participants appreciated the teachers at the center who provided medication when they were sick or applied oint-

ment and took them to the hospital when injured. Teachers at the center also informed the children’s parents about their health condition when they were ill. In those moment, the children were comfortable and happy.

“One day, my younger sibling was sick. They gave medicine here.” (Participant 2)

“I got hurt on the playground. The principal applied ointment and suggested going to the hospital.” (Participant 5)

“I had a fever and felt sick at school. I came here and vomited. The teacher called my dad.” (Participant 12)

(3) Sub-theme 3: enjoyment that delicious food freely

The participants could have dinner and snacks at the children’s center during the school term and all meals during vacations. Most children did not have parents who could provide meals at home, or even if the parents were at home, they provided their children with low-quality meals. The children were happy about eating high-quality and delicious food with their friends at the local children’s center.

“I’m happy to learn cooking from the cooking teacher. I like eating time the most.” (Participant 5)

“I like eating time more than playing time. There is so much delicious food.” (Participant 6)

“There is no food at my house. So, I eat at the community children’s center.” (Participant 10)

3) Theme 3: feeling smart and competent

The participants were happy when they finished their

school homework at the daycare center. The participants got good grades on their school exams because they received tutoring on subjects they struggled with at the local children's center. Participants were happy when they felt a sense of accomplishment both inside and outside the school. And children were happy when they felt confident and their abilities improved. When the participants became leaders of programs at the local children's center, they were happy to think that they were competent and smart.

(1) Sub-theme 1: helping me with my school assignments and teaching me what I'm lacking

The participants liked the education at the children's center, which helped reinforce the school curriculum. They were grateful that the teacher taught them subjects they performed poorly in at the children's center.

"My teacher helped me with my homework. That's why I got a compliment from my school." (Participant 9)

"I'm not good at math. That's why the center's teacher teaches me. I'm a little better at math now." (Participant 17)

(2) Sub-theme 2: improvement in school performance

The participants were happy to learn at the local children's center and get good grades on their school exams because of it.

"I did well on my test at school. I feel good." (Participant 6)

"If you get good grades, you're popular." (Participant 7)

"I got better in math. I did well on my test. I feel happy when I do." (Participant 15)

(3) Sub-theme 3: feeling a sense of accomplishment through local children's center programs

The participants liked the programs at the local children's center. They were happy when they felt a sense of accomplishment as a leader of the program.

"I was the leader when we played volleyball. I was happy that my team won." (Participant 4)

"I was happy to be the main character when I did magic." (Participant 8)

"My teacher complimented me when I was drawing. Me and my friend won the award. It felt great." (Participant 16)

4) Theme 4: feeling loved by someone special

The participants actively asked for help from local children's centers when faced with bullying, difficulties in adapting to school life, and family problems. The teachers comforted the child, and they were comfortable and happy that the problem seemed to be solved through counseling. The teacher's praise and encouragement also made the child happy.

(1) Sub-theme 1: consultation and care when I'm in trouble

The participants appreciated the counseling and comfort they received at the local children's center when faced with difficulties such as school bullying or family conflicts. When receiving counseling, the participants felt secure and comfortable.

"I feel comfortable at the children's center. No one bothers me here." (Participant 12)

"I feel secure here at the center." (Participant 15)

"Sometimes my schoolmates swear at me. I feel very sad. I told my teacher here, and it made me feel less sad." (Participant 19)

(2) Sub-theme 2: to be praised by my teacher

The participants were happy when the teachers at the local children's center praised them. They changed their behavior to hear compliments more.

"I get scolded a lot at school, but I'm happy that the teacher gives me a compliment here." (Participant 2)

"When I come to a daycare center, I feel like I'm coming to play. You're so nice to me, too." (Participant 7)

"She always praises me even when I overreact. That's why I try not to overreact. I want to be a good person." (Participant 9)

5) Theme 5: feeling well-adjusted to school life

The participants felt that they were adjusting well to school with the help of local children's centers. Participants basically had a desire to do well in school. Participants experienced unwitting changes in their lifestyle at a local children's center. Participants had fun making friends at local children's centers, and they had the rhythm of life and were able to live a regular life at children's centers.

(1) Sub-theme 1: helping prepare for my school life

The local children's center helped the children so that they

could adapt well at school. At that time, the children were reassured and happy.

“She brought my supplies to school. Thank you, teacher.” (Participant 12)

“I had to take my slippers to school, but my teacher called my mom.” (Participant 17)

(2) Sub-theme 2: make friends and get closer

The participants made friends at the children’s center. They formed friendships during activities, which made the children happy.

“I’m just happy when I play with my friend.” (Participant 1)

“I don’t have any friends at school. I have three friends at the children’s center. So, I feel good.” (Participant 11)

“I have more friends at the children’s center than at school. I like friends.” (Participant 20)

(3) Sub-theme 3: living a regular and restrained life

The participants enjoyed living according to the children’s center’s timetable. Other friends went to private academies, but they preferred studying and playing at the children’s center. They found a rhythm in life from living in the structured environment provided by the children’s center.

“I like it more here than at school. I love the program here. I live here and follow the schedule.” (Participant 4)

“My schoolmates go to private academies after school. I stay at a children’s center because I don’t go to private academies. I like it here. The reason why I like it here is because there is a fixed cooking time, game time, study time, and play time.” (Participant 10)

“I like children’s centers because I play with my friends every day. There’s something to do every hour here.” (Participant 12)

3. General structure description of the happiness experience of South Korean elementary school students participating at local children’s centers

The elementary school students who participated in this study, experienced happiness at the local children’s center when participating in programs. That promoted freedom and physical and emotional growth, feeling cared for at the

local children’s centers. Since when participants returned home after school, their parents were often not present, being comforted and cared for by the teachers when sick or sad, the teacher at the local children’s centers comforted the children and helped them receive treatment. Lunch and dinner for their parents to prepare were also made at the local children’s centers. The participants were happy to eat enough delicious food at the local children’s centers. Most of all, they were able to participate in the local children’s centers and finish their school homework. They also prepared the supplies necessary for school life in various ways.

While other children attended private academies, participants had to study at local children’s centers due to financial difficulties. Fortunately, the teachers were good at teaching the children. Thus, when participants did well on school exams and their grades went up, they thought, “I’m competent,” and felt happy. The participants also felt a sense of accomplishment when they became leaders in programs run by the center. Furthermore, attending the local children’s centers and feeling loved by precious people made the children happy. When the participants were tired and sad, the teacher at the local children’s centers consulted, comforted, and encouraged the children. The participants felt happiness when the teacher at the local children’s centers complimented them. Attending the local children’s centers improved the children’s capabilities and enabled them to adapt better to school life. The participants who were ostracized at school or had no friends could make friends at the local children’s centers. They felt happy playing with their friends at the local children’s centers. The local children’s centers also provided routine and structure to the participants’ lives after school, which gave them a feeling of happiness. Overall, participants liked the local children’s centers better than the school.

DISCUSSION

The purpose of this study was to examine the meaning of happiness experience in elementary school students participating in local children’s centers. As a result, five themes and 14 sub-themes were identified.

The first theme was “feeling of freedom and joy” The participants were not burdened by their disadvantaged circumstances. Rather, they found joy in living with their friends at the children’s center. The participants were found to feel happy in their sense of freedom. They cited the lack of pressure to participate in the program as a reason for experienc-

ing happiness at the local children's centers.

Children experience high happiness when parents allow them autonomy [9]. At the same time, it is important to protect children to ensure their safety in play [7]. Therefore, local child centers should encourage children to engage in autonomous yet safe activities. What activities can increase children's autonomy must be addressed as a major topic in future research.

In modern times, with the ubiquity of smartphones, children's opportunities for physical activity are decreasing as play using social media increases [11]. However, participation in community activities has a positive impact on children's physical health and life, as well as children's growth related to social and psychological factors [22]. Therefore, local children's centers should propose new activities for children that promote autonomy while increasing their physical activity. State agencies that make policies must continue to provide interest and support for activities that can help children's physical and mental growth.

The second theme was "healthy and pleasant feeling from being cared for" The participants were happy when they were at the local children's center, where they felt protected, were treated or helped for sickness, and were provided with nutritionally balanced meals. In this result, it is emphasized that communities and child-related institutions must provide support and efforts to supply children with nutritionally balanced meals.

The relationship between community participation and multidimensional child growth is important when designing intervention programs. For example, to address childhood malnutrition and obesity, local children's centers should provide nutritional support to help children grow [23]. Furthermore, personalized behavioral interventions are needed for children in community children's centers, that are tailored to each child's diet, physical activity, sleep, media use, and participatory parenting [22]. Ultimately, local children's centers should promote children's well-being by carefully selecting the nutritional status of meals and snacks, educating the children on healthy eating habits. They also need to connect with institutions that can provide health counseling to children from time to time.

The third theme was "feeling smart and competent." The participants completed homework at the local children's center and gained confidence by relearning the subjects they struggled with at school. Children felt a sense of accomplishment and happiness when they scored well on school tests

because of this academic support from the children's center. Prior studies have shown that compared to general children, children who used local children's centers have lower vocabulary development and expressive vocabulary achievement [24], as well as difficulties with reading comprehension [18]. Children receiving services from local children's centers show delays in the development of receptive vocabulary and expressive vocabulary compared to children from ordinary families, and in this case, many children are from multicultural families [24]. However, in this study, despite the inclusion of children from multicultural families, they had positive experiences in terms of educational effects.

The participants felt a sense of accomplishment in school life and were adapting well. Nonetheless, this study still found that children who use the local children's center need a variety of support to reduce stress in school life and strengthen their adaptability. Refer to the relationship between stress and health in children's daily lives [13] and research on improving academic achievement and resilience through social and emotional learning [15].

The fourth theme was "feeling loved by someone special." Some participants were bullied at school and had difficulty making friends. But they felt comfort and great happiness at the local children's centers when the teachers comforted, treated, and counseled them when they were sad or physically struggling. The participants also made many friends at the local children's centers. By experiencing and controlling stress and tension, children can develop resilience and, as a result, achieve psychological stability [25]. Therefore, to improve a child's sense of well-being, teachers must provide human resources and social support, that aide in the child's psychological recovery. If children have difficulty making friends in the future, they should study in depth what the difficulties are. And it is also necessary to further investigate whether children are bullied at local children's center.

The fifth theme was the "feeling well-adjusted to school life." The participants trusted the local children's centers to help them prepare for school. By participating in the center's programs, they were able to live a regular lifestyle. So, the participants thought they could adapt well to school life. School adaptation allows children to interact positively with the school environment by improving their relationships with friends and teachers and gaining confidence through active learning activities [26]. Prosocial behavior in primary school influences subjective well-being, which, in turn, increases subjective well-being in school [10]. Ultimately, activities at the

local children's center help children adjust to school. The fifth theme, which is the result of this study, supports this. In this paper, it was not possible to find out what regular lives children should do to adapt to school and what learning activities are necessary. Future research should reinforce this area.

Children of single-parent, working parents, and multicultural families participated in this study. Participants wanted to meet the unfulfilled parts of care at the community children's center through education, counseling, and physical care. The participants wanted a loving home. For children with family problems, local children's centers should provide ongoing emotional counseling and support services. Local children's center was useful for children to adapt well to school life, to build good ties with their families, and to receive counseling and help in times of need. In this study, only the meaning of how children feel happy using local children's center was investigated.

This study could not find out what kind of inconvenience children experience, what education they want, and what they need. And since it was only targeting one area, there is a limit to the scalability and application of the study. However, finding the meaning of happiness in elementary school students' experience at the local children's center is also to prepare a nursing perspective for social contribution to children's growth and development.

CONCLUSION

In this study, the participants expressed various experiences of happiness at the local children's centers. As a result of analyzing the meaning of happiness, participants were found to feel happy when they had individual freedom, engaged in fun activities, and made many friends at local children's centers. They were also happy when they felt healthy because the children's center took good care of them and solved problems. Participants were found to feel a sense of accomplishment when they helped with school tasks at local children's centers, when teachers helped them with school work, when they improved their learning ability, and when they improved interpersonal relationships. Participants were happy when they felt that they had adapted well to school by living a regular and structured life at local children's centers.

At the local children's center, children viewed their circumstances positively and were improving their capabilities. This study will serve as basic data for implementing various programs and care methods for elementary school students

at local children's centers. The results of this study have limitations in that they were obtained from the special environment of one children's center in one region of South Korea. In order to increase the happiness of children in local children's centers, legislation related to child care should be prepared, and interdisciplinary collaboration related to children's education, programs, and care is continuously needed.

ARTICLE INFORMATION

Authors' contribution

All the work was done by Hae Kyung Jo.

Conflict of interest

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

Funding

None.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

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Development of an integrated health promotion program for school-age children from vulnerable families in South Korea: a methodological study

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Received: March 18, 2025

Revised: April 4, 2025

Accepted: April 8, 2025

Purpose: To describe the process of systematically developing an integrated health promotion program for school-age children from vulnerable families.

Methods: In this study, we applied the first three steps—analysis, design, and development (ADD)—of the analysis, design, development, implementation, and evaluation (ADDIE) model. The analysis step involved a literature review and needs assessment. In the design step, program components were considered and a program draft was developed. The program content was modified based on expert validation in the development step. The preliminary program was administered in the implementation step, and the final program was confirmed in the evaluation step.

Results: The program contents were based on the literature review, needs assessment, and Ryan's integrated theory of health behavior change. The content was valid, and the educational material was appropriate for school-age children from vulnerable families. The finalized program consists of six sessions to promote physical, psychological, and social health using individual/group and face-to-face/online methods, including two that involve both parents and children.

Conclusion: This study presents a detailed description of how the program was developed and illustrates the critical elements that should be considered during similar program development. The effect of this program on health promotion behavior should be examined in future research.

Keywords: Child; Health promotion; Nursing methodology research; Program development; Vulnerable populations

INTRODUCTION

School-age is a critical stage in childhood which forms the lifestyles that determine the health status in adulthood [1]. Since it establishes the foundation for long-term health, monitoring and managing lifestyles and health promotion behaviors in this phase are crucial [1,2]. Children from vulnerable families are more likely to face health risks than those from other families [3]. In Korea, vulnerable families lack socioeconomic and human resources, considering both economic and

structural factors [4,5]. Economically, these families include recipients of the National Basic Livelihood Security Program (BLSP) and households with incomes $\leq 50\%$ of the median national income (second-lowest income bracket). Structurally, vulnerable families consist of children from single-parent households, grandparent-headed households, those without parental care, or multicultural families [4-6].

Building on previous research, this study defines children from vulnerable families using both economic and structural factors as criteria. Specifically, vulnerable children are identi-

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fied as those from low-income households (e.g., recipients of BLSF or those in second-lowest income bracket), single-parent families, grandparent-headed families, or multicultural families [4-6].

Self-regulation is a key personal factor in inducing health-promoting behaviors and is highly predictive of the behavior [7,8]. School age is a crucial period for developing self-regulation [9]. During this stage, children develop specific inhibitory controls (e.g., behavioral inhibition, cognitive and selective attention) that are components of self-regulation [9]. Additionally, higher-level cognitive skills such as planning and problem-solving emerge, both of which are closely linked to the development of self-regulation [7-9]. Children with low self-regulation often adopt unhealthy lifestyles driven by immediate gratification caused by immature defense mechanisms, emotional dysregulation, and limited judgment. Previous studies have demonstrated that higher levels of self-regulation in children are directly associated with improved health outcomes [7,8,10]. Furthermore, individuals who effectively manage healthy lifestyles during childhood are more likely to sustain good health throughout their lives [7,11]. Therefore, enhancing self-regulation skills in school-age children may serve as a cost-effective strategy for reducing the risk of chronic diseases associated with lifestyle choices [7].

Self-efficacy is closely related to self-regulation; the lower the self-efficacy, the greater the inability to regulate oneself and the tendency to engage in inappropriate behavior [12]. Even when short-term self-regulation is achieved, children with low self-efficacy are more likely to relapse into self-regulation failure. Therefore, enhancing self-efficacy is essential as a complementary strategy to achieve long-term success in self-regulation [13]. Social support is a major environmental factor that maintains physical and mental health by regulating the degree of the impact of health crises [8,14]. In particular, family plays a crucial role in child health promotion as children acquire several health behaviors within the family environment [14]. Peers are another significant source of social support; they can encourage positive healthy lifestyle habits but may also reinforce negative health behaviors through social interaction [7,8]. Thus, social support from both parents and peers is an essential factor in promoting children's health behaviors [8].

Many children from vulnerable families face heightened risk of physical (e.g., obesity due to fast food consumption), psychological (e.g., depression and anxiety), and social (e.g.,

bullying and lack of social skills) health problems [3,8,14]. These risks stem from limited access to education and health-care services, inadequate care at home, increased exposure to health risk factors, and a lack of protective factors such as family support [5,8]. Park [8] emphasizes that promoting self-regulation, enhancing self-efficacy, and strengthening social support—including family support and positive peer relationships—are essential for improving the health behaviors of children from vulnerable families. Generally, health problems in one area lead to that in other areas, or gradually spread to other areas [14,15]. As a result, children in vulnerable contexts frequently experience physical, psychological, and social problems simultaneously [14]. Addressing these interconnected health issues requires an integrated approach that considers their interrelations rather than isolating specific factors or areas [4,14]. However, most existing studies have developed interventions targeting physical, psychological, and social health separately [16-20].

Moreover, all existing health promotion programs focus on the intervention effects, and studies that systematically present the process of program development are scarce [16-20]. To address this gap, we present a detailed methodological description of the development of an integrated health promotion program using the first three steps—analysis, design, and development (ADD)—of the analysis, design, development, implementation, and evaluation (ADDIE) model [21]. This model is a systematic and linear process represented by interacting steps in instructional design [21]. It is one of the most commonly used instructional design methods that guides the development of programs in various disciplines. The systematic and elaborate description of the process of developing a health promotion program for children from vulnerable families may help healthcare professionals develop and apply customized health promotion programs based on various community environments.

The conceptual framework of this study was based on the integrated theory of the health-behavior change (ITHBC) developed by Ryan [21]. It aims to maintain and improve people's health status by changing their behavior. According to the ITHBC, health behavior changes can be enhanced by fostering knowledge and beliefs, increasing self-regulation skills and abilities, and enhancing social facilitation.

Knowledge and beliefs form the first construct. Knowledge is defined as condition-specific factual information and beliefs are personal perceptions about a specific health condition or behavior [21]. This construct comprises behavior-spe-

cific knowledge, self-efficacy, outcome expectancy, and goal congruence [21]. The second construct describes self-regulation skills and abilities. It encompasses goal setting, self-monitoring and reflective thinking, decision-making, planning for and engaging in specific behaviors, self-evaluation, and managing physical, emotional, and cognitive responses associated with health behavior change [21]. The third construct, social facilitation, involves social support and active collaboration among individuals and families to promote health outcomes [21].

Outcomes in this theory are categorized as proximal and distal. The proximal outcome is actual engagement in self-management behaviors specific to a condition or health behavior [21]. Distal outcomes refer to the long-term effects of individual behavior on health status, with failure to engage in healthy behaviors potentially leading to the premature onset of diseases [21]. Distal outcomes are partially dependent on the successful achievement of proximal outcomes [21]. This study assumed that information on health promotion, self-efficacy in performing health-promoting behaviors, participation with parents and peers, and social support improve self-regulation of health-promoting behaviors, leading to participation in an integrated health promotion program and health promotion behavior. The relationships among the constructs, concepts, and variables according to the ITHBC model are shown in Figure 1. An integrated health promotion program is an intervention designed to promote physical, psychological, and social health based on the holistic view that humans are biologically, mentally, and socially interconnected [22]. In this study, the program is developed following the definition by Jung and Chin [22] and incorporates key elements of the ITHBC [21], including health knowledge, self-efficacy, social support, and self-regulation. Therefore, this study aimed to describe the process of sys-

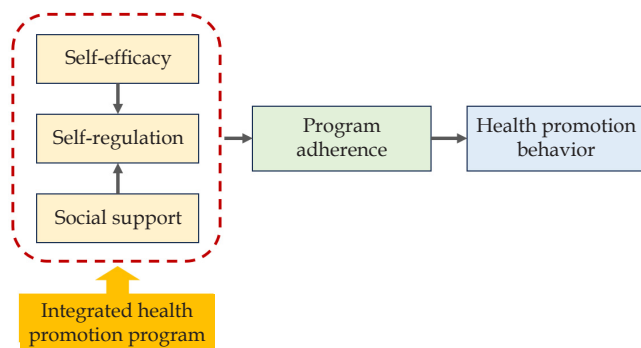


Figure 1. Conceptual framework of this study.

tematically developing an integrated health promotion program for school-age children from vulnerable families.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of the Yonsei University Health System (IRB no., 4-2022-0484). Informed consent was obtained from all participants.

1. Study Design

A methodological study design was used to develop an integrated health promotion program for school-age children from vulnerable families. The reporting of this study was based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [23].

2. Methodological Model

The program was developed using the first three steps—analysis, design, and development—of the ADDIE model.

1) Step 1: analysis

(1) Literature review: health promotion interventions for children from vulnerable families

To develop the program, interventions to improve health promoting behaviors in school-age children from vulnerable families were evaluated. Relevant studies published in English or Korean in peer-reviewed journals between January 2012 and August 2022 were reviewed. A search of databases including PubMed, Web of Science, CINAHL, PsycINFO, and RISS databases was conducted using a combination of medical subject headings (MeSH) and keywords (Supplement 1). The inclusion criteria for the selected articles were as follows: (1) studies with elementary school children aged 6–12 years from low-income households, single-parent families, grandparent-headed families, or multicultural families (including minority backgrounds); (2) implemented health promotion interventions; and (3) reported health-related outcomes. Eleven studies were selected based on the criteria. We have followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines for the literature review. A flowchart of the selection process is shown in (Supplement 2).

(2) Focus group interviews: needs assessment

To determine the content inclusion criteria, focus group interviews (FGIs) were conducted by a doctoral researcher with nearly 10 years of clinical experience in child health nursing to identify the health promotion needs of children. Dream Start, a representative institution that cares for vulnerable families, was considered by the researchers as a source of participants for the FGIs (e.g., BLSP recipients, second-lowest income bracket, and single parent). The participants were selected with the cooperation of five Dream Start centers in Seoul. Convenience sampling, in which the manager of the institution introduced the participants, was used to recruit participants. Three FGIs were conducted with elementary school children (grades 5–6) from vulnerable families, their mothers, and Dream Start case managers who directly managed the health and welfare of the vulnerable families. The FGIs were conducted between July 25 and August 5, 2022, with participants divided into three groups: children, parents, and Dream Start managers. Six children, five mothers (one mother refused to attend the FGI and withdrew participation), and five Dream Start managers (a total of 16 participants) participated in the FGIs via Zoom (Zoom Video Communications) because of the coronavirus disease 2019 (COVID-19) pandemic-related restrictions. Key interview questions used with the children are described. For parents and Dream Start managers, the same questions were used with slight modifications to the wording, referring to “your children” or “the children you care for” instead of “you.” (1) Have you ever experienced any health-related problems or difficulties? If yes, what kind of health-related problems or difficulties have you experienced? (2) What factors (both positive and negative) affect your health promotion efforts? (3) What kind of content should be included in health promotion education? (4) If you were to receive health promotion education, which method would you prefer: face-to-face or online?

2) Step 2: design

During the design step, a program draft was created based on the results of the previous steps. The number of sessions, components, and activities of the program were determined following the literature review and needs assessment.

3) Step 3: development

Six experts evaluated the content validity of the program using a content validity index (CVI). The expert group con-

sisted of three child health nursing professors (PhDs), one social welfare professor (PhD) and two case managers (social workers with Master of Social Work degree) from Dream Start. Content validation was conducted from September 5 to 12, 2022. Between September 7 and 8, 2022, a preliminary review of the draft program was conducted at Dream Start with two managers and two fifth-grade elementary school students. Feedback was collected regarding difficult vocabulary and content that might be challenging for children to understand or implement in practice.

RESULTS

1. Analysis

1) Literature review: health promotion interventions for children from vulnerable families

All 11 selected studies included children from low-income families, one study included families with single-parent, and one included families belonging to minority communities [3,16-20,24-28]. The intervention period ranged from 5–12 weeks, with each session lasting for 30–120 minutes. Seven studies (64%) included interventions designed to improve physical health, 3 (27%) to improve mental and social health, and 1 (9%) to promote physical, psychological, and social health. Various delivery methods were used, including face-to-face instructions, group activities, newsletters, and telephone counseling. To maintain children’s interests, mixed-mode interventions were delivered, such as group play and education, group activities, and counseling, rather than a single-mode ones. The details are provided in [Supplement 3](#).

Based on the literature review, the following intervention strategies were identified. First, in most interventions, education was provided for each subject and various activities such as cognitive behavioral therapy, play activities, peer activities, meditation, and gymnastics were conducted [3,16,18,20,25,28]. To deliver the intervention in a way that is easy to understand and arouses interest, considering the nature of children, a mixture of multiple approaches was used. As such, the interventions were established to include activities that would stimulate children’s interest and participation along with the necessary health education content.

Second, all studies were group interventions in which peers participated, but in some (18%), individual counseling was provided with group intervention to confirm the effectiveness of the intervention on health promotion [3,17].

Therefore, counseling for a child’s health promotion, along with education and activities for common health improvement, was selected as an intervention strategy.

Third, in four studies (36%), parents participated in interventions to improve the health of their children [3,17,20,27]. Considering that parents are an important source of social support for children and that children from relatively vulnerable families have fewer opportunities to interact with their parents, interventions involving parents were selected as a strategy [29].

Finally, none of the 11 studies was theory-based. To generate high-quality evidence for the development of future programs, it was necessary to develop theory-based interventions and evaluate its effectiveness [5].

2) Focus group interviews: needs assessment

In the children’s group, the average age was 11.83±0.41 years, and there were four male (66.7%) and two female students (33.3%). All 6 (100%) were eligible for basic livelihood support; 3 (50%) were from single-parent families. The participating mothers’ average age was 42.80±11.83 years. All belonged to families eligible for BLSP and 3 (60.0%) were sin-

gle parents. The average age of the five case managers was 49.00±7.14 years. From the four main questions on the FGIs, 10 categories and 20 subcategories were identified (Table 1).

(1) Key question 1: Health-related problems: physical, psychological, and social health problems

Children from vulnerable families often experienced complex health problems. The most common physical health problems in children were overweight and slow growth. In particular, issues emerged due to the consumption of instant food, which causes inadequate nutrient intake, and a lack of physical activity. Additionally, they were exposed to sensational content and secondary sexual characteristics and expressed concern about the difficulty in forming correct sexual values. Their psychological health problems were typically associated with excessive use of smartphone and games. They had a high level of stress as a result of schoolwork and peer relationships, and their psychological health problems worsened because of low self-esteem. Health problems associated with social problems appear as difficulties in peer relationships, with bullying at school being a prominent example. As a result of bullying, many children had difficulty

Table 1. Results of the focus group interview

Domain	Category	Sub-category
Health-related problems or difficulties	Physical	<ul style="list-style-type: none"> • Overweight and growth delays • Secondary sexual characteristics and sexual video exposure
	Psychological	<ul style="list-style-type: none"> • Low self-esteem • Smartphone, game, and internet overdependence
	Social	<ul style="list-style-type: none"> • Difficulty with peer relationships and bullying
Factors affecting health promotion	Parental health-related care	<ul style="list-style-type: none"> • Parents’ willingness to care for their children’s health • Communication between parents and children
	Environment for health-promoting behavior	<ul style="list-style-type: none"> • Lack of opportunities to acquire health promotion behaviors
Contents for the health promotion program	Physical	<ul style="list-style-type: none"> • Nutrition education with cooking • Sex education reflecting the modern era • Smoking and alcohol prevention education, including coping strategies
	Psychological	<ul style="list-style-type: none"> • Easy-to-understand safety education • Compliments to improve self-esteem • Self-regulation on smartphone use
	Social	<ul style="list-style-type: none"> • Group activities to promote peer relationships
	Interesting components of the program	<ul style="list-style-type: none"> • Child-friendly educational content • Programs involving parents and peers • Positive messages and rewards to motivate health promotion • Individual and tailored health promotion intervention
Preferred methods of education: face-to-face or online	Interactive face-to-face program	<ul style="list-style-type: none"> • The preference for face-to-face interventions which allow researchers and children to interact

forming interpersonal relationships and were passive in participating in school and after-school activities.

(2) Key question 2: Factors affecting health problems: facilitators and barriers

The health promotion behaviors of school-age children from vulnerable families were heavily influenced by their parents, who were their main support system. When parents were indifferent to their children's health problems, the children experienced various issues because of inadequate formation of healthy habits. Most children mentioned that they did not have an adult to inform them about health-promoting behaviors or that they did not have a chance to consider their health.

(3) Key question 3: Contents for health promotion program: physical, psychological, and social health promotion and interesting components

As children from vulnerable families experience physical, psychological, and social health problems, the program's demand for integrated healthcare was confirmed. The demands of the physical health promotion program were nutrition education along with cooking classes, sex education reflecting the modern era, such as addressing dating, and education to practice rejecting situations in which peers encouraged smoking and drinking. In psychological health promotion program, an educational program was needed to enhance self-esteem and the ability to discriminate between smartphone content. To promote social health, it was essential to develop positive relationships with peers through group activities. It was found that the health promotion program for school-age children from vulnerable families requires interesting educational content, such as child-friendly educational plans, positive feedback, and parent-involved content to promote children's participation and positive outcomes. To achieve this, easy terms and familiar characters should be used in the education plan. The need for tailored interventions based on each child's health status and habits was also identified. In addition, FGI participants recommended that their parents and peers participate together in preventing dropout by providing positive messages or appropriate rewards.

(4) Key question 4: Education methods: interactive face-to-face

Face-to-face delivery of interventions was more effective and interesting for children than online delivery. Most FGI

participants were concerned about communication difficulties in online programs. A face-to-face program is required to achieve communication between researchers and children and positive health promotion results.

In summary, the FGIs revealed that school-aged children from vulnerable families experienced various physical, psychological, and social difficulties. In addition, parents' health-related caring behavior for the child, stigma, and lack of opportunity to acquire health behaviors were factors influencing children's health promotion behavior. Accordingly, the demand for an integrated health promotion program to improve children's physical, mental, and social health was confirmed. Thus, parental and peer participation and positive feedback were found to be necessary intervention strategies.

2. Design

Based on the ITHBC, literature review, and needs assessment, the components of the program were organized in the design step (Table 2). A program draft was created based on the findings of the previous steps (Supplement 4). A literature review of interventions to improve children's health revealed an implementation period of over 6 weeks. Moreover, the duration of children's group programs should not exceed 8 weeks because they may not be able to complete a lengthy program [30]. Therefore, the intervention in this study was planned for six sessions (6 weeks). Most studies in the literature review utilized group education; however, needs assessments suggested that individual interventions should be included based on each child's health status. Therefore, a mix of group and individual education program was developed.

To promote "knowledge and self-efficacy," the first construct of the ITHBC, a group education was planned to provide knowledge about physical, psychological, and social health (i.e., healthy eating habits and physical activity, sexual health, safety education, alcohol and smoking prevention, smartphone use control, and psychological health). To emphasize self-efficacy, the educational content included the definition of self-efficacy, methods for enhancing it, and the delivery of positive messages about health-promoting behaviors. The program also incorporated components to help children set health goals that they could independently achieve (ITHBC facilitators: goal congruence) and counseling sessions to discuss the expected health outcomes (ITHBC facilitators: outcome expectancy).

Individual interventions aimed to establish and evaluation

Table 2. Components of the integrated health promotion program based on theory, literature review, and needs assessment

Theoretical construct	Facilitators of theoretical construct	Components based on the literature review	Components based on the needs assessment
Knowledge and self-efficacy	• Condition-specific knowledge	• Providing education on health promotion behavior (group education)	• Providing education on health promotion behavior (face-to face)
	• Personal perception	- Organizing education to promotes the interest and participation of children	- Nutrition education with cooking
	- Self-efficacy	• Motivation for health promotion	- Sex education reflecting the times
	- Outcome expectancy	- Individual counselling for health promotion behavior	- Smoking and alcohol prevention including coping strategies
	- Goal congruence	• Theory-based program	- Easy to understand safety education - Self-regulation of smartphone use • Compliments to improve self-esteem • Positive messages and rewards to motivate health promotion
Self-regulation	• Goal setting	-	• Individualized and tailored health promotion intervention; setting, monitoring, and evaluating individual health promotion goals.
	• Self-monitoring and reflection		
	• Planning and plan enactment • Self-evaluation		
Social support	• Influence support	• Providing support by involving parents in the program	• Programs involving parents and peers • Group activities to promote peer relationship • Interactive face-to-face program

health promotion goals based on each child’s health status to promote “self-regulation.” Children are to independently monitor their progress toward the individual health-promotion goals they have set (ITHBC facilitators: goal setting, self-monitoring and reflection, and self-evaluation), evaluate their achievements, and openly share their emotions and experiences during individual counseling sessions. Following the literature review and needs assessment that highlighted the importance of involving parents and peers in the program to foster “social support,” the program was designed to include interactive face-to-face peer group activities and family counseling sessions (ITHBC facilitator: social support). Furthermore, the program was designed to provide rewards (e.g., gift vouchers) to children for homework thereby promoting common physical activities. Although the preference for the face-to-face program was confirmed in the needs assessment, family counseling was conducted online to increase parental participation in the program.

3. Development

The item (I)-CVI was included in the program content through lesson plans and session-specific workbooks. The overall CVI was .97 and the I-CVI ranged from .83–1.00,

which was considered valid [31]. Several aspects of the program were revised and supplemented with feedback from the experts. Nutrition education was expanded to include information on junk food and methods for checking food nutrients. Second, coping methods were included in sexual health education when recommending pornography and online grooming. Third, there was an opinion that children should have the opportunity to fully share their experiences during each program session. Accordingly, in sessions 2–4, children were given 5–10 minutes or more to express their feelings regarding the intervention.

A preliminary review of the draft program found that the content of each session was appropriate. Reviewers noted that the program was easy to understand and engaging given its use of various visual materials.

However, they highlighted that some words, such as “promotion,” are difficult for fifth graders to understand. There was a comment about the 4-minute duration of the video on how to refuse smoking and drinking. The video was replaced with an another lasting approximately 2 minutes. In the fifth session, it was suggested that it would be helpful to have time to discuss and resolve concerns. Accordingly, a concern pocket was created to allow children to express their concerns anonymously in each session. In the fifth session, writ-

ten concerns were incorporated into board game-style worry-counseling activities.

The final program was named Integrated Health Promotion (I-HERO) (Table 3, Supplement 5). The program consisted of six sessions of 40–60 minutes each, once a week, combining individual and group interventions. The program involved online intervention for the first and sixth sessions for children and parents of each family and face-to-face group intervention with peers from the second to fifth sessions. The first session provides an overview. In this session, the researcher, child, and parent discuss the child’s typical healthy habits, as well as those that require more effort. From these discussions, health promotion goals are established for each child. Next, the researcher sends a positive text message to the children and parents, specifying the goals that were set.

The second session focuses on physical activities and a healthy diet. To encourage physical activity for at least 30 minutes, 3 times per week, a free health app (Samsung Health, Samsung) is used to record physical activity time and homework steps. KakaoTalk group chat room (Kakao Corp.) is used to verify the time and degree of physical activity shared by participants in each group via the Together mission of the health app. Participants would also be able to communicate directly with the researcher through KakaoTalk. A group activity in this session involves creating healthy salads to increase fruit and vegetable consumption.

The third session is about sexual health education. Children could share their puberty experiences with each other. During the third session, children make warning signs of

sexual violence, explain them to peers, and vote on them. The I-HERO awards are announced at the end of the session based on the results of the physical activity completed as homework from this session to the fifth.

Topics for the fourth session include safety accidents and smoking and drinking. Situational play is used to practice refusal when peers encourage smoking or drinking. A group activity allows participants to share their impressions after playing games such as walking along footprints while wearing drinking glasses.




The fifth session focuses on enhancing self-esteem, controlling emotions, and preventing media overdependence. Through meditation and stretching, children learn how to control their emotions, manage stress, and express their emotions effectively using I-message. Board games are used to discuss solutions to anonymously-submitted concerns. In this session, children write commendations on rolling paper for their peers.

The sixth session is conducted in the same manner as the first session. Health promotion goals outlined in the first session are discussed and evaluated by parents, children, and researchers. Children freely discuss their efforts to attain their health promotion goals, and parents discuss their efforts to ensure that their children maintain their health promotion goals.

DISCUSSION








Improving the effectiveness of health-promotion interven-





Table 3. The final version of the integrated health promotion program

Session	Topic	Goal	Contents	Activity	Homework	Delivery methods
1 (45 min)	• Orientation (I-HERO)	<ul style="list-style-type: none"> • Understanding the concept of health promotion • Health promotion goal 	<ul style="list-style-type: none"> • Program introduction • Individual health promotion goal and plan 	• Goal-setting for individual health promotion	• Achieving individual health promotion goals	<ul style="list-style-type: none"> • Lecture • Counselling • Sending a positive text message 
2 (50 min)	<ul style="list-style-type: none"> • Healthy diet • Physical activity 	<ul style="list-style-type: none"> • Understanding the importance of a healthy diet • Providing motivation for promoting physical activity 	<ul style="list-style-type: none"> • Balanced nutrition • Avoiding junk food • Importance of physical activity • Introducing the health app and KakaoTalk group chat 	• Cooking class: vegetable fruit salad	<ul style="list-style-type: none"> • Physical activity 	<ul style="list-style-type: none"> • Lecture • Video 

(Continued on the next page)

Table 3. Continued

Session	Topic	Goal	Contents	Activity	Homework	Delivery methods
3 (50 min)	• Sexual health	<ul style="list-style-type: none"> • Understanding the change in body and mind during puberty • Being polite to a boy (girl) friend • Knowing how to respond to sexual violence 	<ul style="list-style-type: none"> • Physical and mental development in adolescence • Etiquette between the boy and girl friend • Situational play dealing with sexual violence 	<ul style="list-style-type: none"> • Creating a warning sign for sexual violence • I-HERO award 	<ul style="list-style-type: none"> • Physical activity 	<ul style="list-style-type: none"> • Lecture • Video 
4 (55 min)	<ul style="list-style-type: none"> • Safety accident • Smoking and drinking 	<ul style="list-style-type: none"> • Understanding the concepts of safety accidents and first aid • Preventing safety accidents • Effects of smoking and drinking on our bodies • Expression of refusal when smoking or drinking is recommended 	<ul style="list-style-type: none"> • Safety accident prevention and emergency treatment according to the situation • Rates of smoking and drinking among adolescents • Effects of smoking and drinking on our body • Complete the sentences that deny smoking and drinking 	<ul style="list-style-type: none"> • Game using drinking glasses and sharing the feelings • I-HERO award 	<ul style="list-style-type: none"> • Physical activity 	<ul style="list-style-type: none"> • Lecture • Video 
5 (60 min)	<ul style="list-style-type: none"> • Media usage • Psychological health 	<ul style="list-style-type: none"> • Understanding the concept of media dependence and how it affects us • Learning how to use media correctly • Understanding the concept of psychological health • Emotion and stress 	<ul style="list-style-type: none"> • Knowing about media dependence • Selecting appropriate media information (selecting media contents) • Enhancing self-esteem • Managing emotion and stress 	<ul style="list-style-type: none"> • Resolving anonymous concerns via a board game • Writing positive messages about peers' strengths and compliments • I-HERO Award 	<ul style="list-style-type: none"> • Physical activity 	<ul style="list-style-type: none"> • Lecture • Video 
6 (40 min)	• Evaluation of health promotion behavior	<ul style="list-style-type: none"> • Evaluation of individual health promotion goals and plans • Establishing long-term health promotion goals and plans 	<ul style="list-style-type: none"> • Discussing experiences from participating in the program • Expressing my efforts toward my health promotion goal 	<ul style="list-style-type: none"> • Evaluation of individual health promotion goals and plans • Establishing long-term health promotion goals and plans 	<ul style="list-style-type: none"> • Continue trying to encourage health promotion behavior • Counselling 	

: online counseling for each family involving parents; : face-to-face group education and activity with peers; : recording physical activity (step count, activity time) with the free health app (Samsung Health); : certifying physical activity through the KakaoTalk group chat (Kakao Corp.). I-HERO, Integrated HEalth pROMotion.

tions requires logical and systematic development. This study systematically developed interventions following the ADD of the ADDIE model. To develop an integrated health promotion program for children from vulnerable families, this study adopted a holistic perspective, integrating the physical, psychological, and social dimensions of health promotion as proposed by Jung and Chin [22]. Additionally, we applied the ITHBC model by Ryan [21], highlighting that integrated health promotion—encompassing health knowledge, self-efficacy, and social support—enhances self-regulatory skills, in turn leading to health-promoting behaviors.

A literature review of health-promotion interventions for children from vulnerable families revealed that none of the studies applied a theoretical framework. A theoretical framework assists in developing hypotheses, identifying exogenous variables that may influence the effectiveness of experimental interventions, and facilitating the discussion of research findings [32,33]. The present study was based on the ITHBC model by Ryan [21], program's purpose, variables, and principal components were designed to reduce the gap between theory and practice through theoretical validation. To improve the health of children of vulnerable families, it is necessary to continuously verify and expand theories through development and application of theory-based interventions [8].

Many children from vulnerable families struggle with multiple physical, psychological, and social health problems [3,5,25,27]. Nevertheless, existing studies have typically provided interventions for fragmentary health promotion, which may not solve complex and multidimensional health problems [16,17,20]. Considering that the proposed program is an integrated health education program tailored to the characteristics of children's health problems, it is expected to effectively address the complex and multidimensional nature of children's health problems.

The duration and number of group intervention sessions for children must be carefully considered to ensure they are interested and can concentrate. Participation in a lengthy session may be challenging for children. Although short-term interventions may have high participation rates, their effectiveness may be difficult to determine. Therefore, studies have recommended group interventions lasting 6–8 weeks and 40–60 minutes per session for children [30,34]. The present study designed a 6-week integrated health promotion program, with sessions lasting approximately 40 minutes and breaks of more than 10 minutes between sessions. Re-

search has noted the advantage of allowing participants to share their common concerns if they have an unusual experience with a group intervention [35].

Individual interventions can also effectively reinforce children's positive beliefs and elicit their emotions [36]. A combination of individual family and group interventions was used in this study. According to the children participating in our study, both the program with peers and the time to discuss their health individually were beneficial. Providing face-to-face interventions to children increases their psychological stability and concentration through interaction with the provider [37]. However, in situations such as the COVID-19 pandemic, online interventions are recommended for flexibility in terms of time and place and to increase research participation [38]. The present study used a blended method of an online intervention in which children and parents participated together as families and a face-to-face one in which children received group education. Previous studies have demonstrated high satisfaction with education when both children and parents are involved using a blended intervention delivery method [38]. Consequently, blended intervention delivery in education involving both parents and children can serve as a critical operational strategy to maximize intervention effectiveness and engagement [38,39].

This methodological study has some limitations. First, although this study described the program development process following the ADD steps of the ADDIE model, a systematic intervention development framework, we could not evaluate its effectiveness. Therefore, follow-up studies are needed to evaluate the effectiveness of this program.

Second, the program development process was relatively straightforward and could not consider complex issues or multiple variables. This may limit the program's applicability and flexibility. Future study should design a program development that considers various variables and complex problems, thereby increasing the program's applicability and flexibility. This may enhance the practicality and generalizability of the program.

Third, this study primarily focused on children in the upper grades of elementary school, who came from vulnerable families. Although self-regulation abilities develop mainly during elementary school years, there are differences in how lower and upper grade elementary students understand health promotion. Therefore, future research should develop health promotion programs that are centered on self-regulation and tailored to children in the lower grades of elementa-

ry school, who come from vulnerable families.

Finally, this study developed an integrated health promotion program based on the ITHBC. While this theory has been applied to interventions promoting physical activity, weight management in children, and health behaviors in children with illnesses, it was not specifically designed for children from vulnerable families. Therefore, applying ITHBC to this population may be considered a limitation. Future research should aim to develop and validate theoretical frameworks specifically tailored to the health promotion needs of children from vulnerable backgrounds.

This study has significant implications for practice. The program developed in this research was created by experts in child healthcare, providing participants with practical advantages in terms of information and resources for addressing and managing children's health issues. Moreover, these programs can be regularly taught and disseminated to healthcare professionals involved in children's health at community institutions. A key strength of this study is its systematic approach to developing a health promotion program specifically designed for children from vulnerable families, distinguishing it from existing programs for school-aged children. By providing foundational data for health-related interventions tailored to this population, this study offers valuable insights with significant practical implications.

CONCLUSION

This study was conducted to develop an integrated health promotion program for school-age children from vulnerable families using the ADD steps of the ADDIE model. The literature review, needs assessment, and ITHBC were followed to develop the content of the program. The content of the program was valid, and the educational material was appropriate for school-age children from vulnerable families. The detailed description of the development process of the program illustrates the critical elements that should be considered in program development and implementation.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: EB, EKC. Data collection: EB. Formal analysis: EB. Writing—original draft: EB. Writing—review and editing: EB, EKC. Final approval of published version: all authors.

Conflict of interest

Eun Kyoung Choi has been an editor of *Child Health Nursing Research* since 2020. 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 Eunjeong Bae in partial fulfillment of the requirements for the doctor's degree at Yonsei University.

Funding

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (RS-2023-00248788). The funding source had no involvement in the study design, data analysis, interpretation, or the writing of the manuscript.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

This study was conducted with the support of the 2022 Health Fellowship Foundation, the Brain Korea 21 FOUR Project funded by the National Research Foundation (NRF) of Korea at Yonsei University College of Nursing, and the Sim Chijung Scholarship from the College of Nursing at Yonsei University in 2022. Additionally, this research was partially funded by the Sigma Theta Tau International Honor Society of Nursing, Lambda Alpha Chapter-at-Large, in 2022. We would like to express our sincere gratitude to Professors Sunah Kim, Gwang Suk Kim, Sun-Mi Chae, and Hyunju Kang for their invaluable support and guidance throughout this research. Their expertise and encouragement have greatly contributed to the completion of this study. We gratefully acknowledge the children, parents, and managers of Dream Start for their generous participation and support.

Supplementary material

Supplement 1. Literature search strategy.

Supplement 2. Data search using the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) flow diagram. RCT, randomized controlled trial.

Supplement 3. Literature review: components and outcomes of the implemented health promotion program for children from vulnerable families.

Supplement 4. The draft of the integrated health promotion program.

Supplement 5. Examples of educational materials developed in this study.

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Factors influencing on future core nursing competency: focusing on King's Dynamic Interaction System Model in South Korea: a cross-sectional study

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Received: February 23, 2025

Revised: April 4, 2025

Accepted: April 8, 2025

Purpose: This study aimed to examine the relationship between future core nursing competencies and key variables, identifying factors influencing these competencies among senior nursing students.

Methods: This cross-sectional study included 150 third- and fourth-year nursing students in South Korea. Based on King's Dynamic Interaction System Model, perceived work value and individual innovative behavior were categorized as personal systems, interpersonal competence as an interpersonal system, and adhocracy culture as a social system. Participants completed self-reported online questionnaires to assess factors influencing future core nursing competencies.

Results: Hierarchical multiple regression analysis identified interpersonal competency ($\beta=0.32, p=.012$) and adhocracy culture ($\beta=0.23, p=.010$) as significant predictors of future core nursing competency explaining 30.9% of the variance.

Conclusion: Enhancing future core nursing competency among senior nursing students requires continuous education and counseling programs to strengthen interpersonal competency. Establishing an adhocracy culture involves recognizing creative ideas, fostering open communication for freely expressing ideas, and encouraging innovation. Therefore, developing interpersonal competence and promoting an adhocracy culture is essential for improving future core nursing competency in senior nursing students.

Keywords: Clinical competence; Interpersonal relations; Nursing; Organizational culture; Organizational innovation

INTRODUCTION

The healthcare sector-nursing has undergone significant global transformations with the introduction of the Fourth Industrial Revolution, which include integrating innovations such as electronic health records, telemedicine, virtual reality, clinical decision support systems, and robotics [1]. These technologies are reshaping nursing practice and education, improving healthcare efficiency and accessibility while expanding opportunities for professional competency develop-

ment [1,2].

In response to these advancements, Kim [2] proposed that 21st-century nurses should develop future core nursing competencies, including personal thinking, professional responsibilities, professional identity, and social-emotional skills, to adapt to the rapidly evolving healthcare landscape shaped by the Fourth Industrial Revolution [2]. These core competencies consist of four key areas: (1) "personal thinking competency," which includes critical thinking and problem-solving for recognizing and assessing situations; (2) "task compe-

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tency,” integrating knowledge, skills, evidence-based practice, and information technology to effectively perform nursing responsibilities; (3) “professionalism competency,” encompassing leadership and a professional mindset within domestic and global healthcare systems; and (4) “socio-emotional competency,” involving self-regulation, emotional management, empathy, and respectful communication based on self-awareness and understanding of others [2]. Sroczyński et al. [3] also emphasized the importance of future nursing core competencies including patient-centered care, professionalism, leadership, systems-based practice, communication, team work and safety. Future core nursing competencies are essential for leading healthcare in the Fourth Industrial Revolution era. These competencies are increasingly important as healthcare integrates innovations such as electronic health records and telemedicine. These could help nurses adapt to the rapidly evolving healthcare landscape shaped by the Fourth Industrial Revolution [2,3].

Out of nursing competency, Lee [4] emphasizes that patient-centered nursing requires empathy and understanding—qualities irreplaceable by robots. Similarly, Aunguroch and Gunawan [5] highlight the need to integrate new technologies with a care-focused approach guided by philosophy, academic principles, and critical thinking. Additionally, competencies in utilizing big data and artificial intelligence have become increasingly vital in the Fourth Industrial Revolution [1]. The Korean Accreditation Board of Nursing Education also emphasizes future core nursing competencies, particularly social-emotional competency. This competency involves recognizing and managing emotions in interpersonal relationships while promoting self-regulation, emotional management, empathy, sincerity, and respect for others [2,3].

Consequently, contemporary nursing education has shifted from traditional knowledge- and skill-based methods to goal-oriented approaches that prioritize human-centered care, including understanding patient needs, illness experiences, professional attitudes, and communication skills. These changes prepare nursing students to meet the evolving societal demands [3]. With the Fourth Industrial Revolution advancing, enhancing future core competencies is essential. Thus, developing these competencies in senior nursing students through curricula will enable them to acquire and integrate advanced knowledge and skills in personal thinking, professional duties, professional identity, and social-emotional competencies.

The Dynamic Interacting Systems Framework by King [6]

offers a conceptual basis for understanding future core nursing competencies among nursing students. This framework views humans as open systems interacting with their environment and explains the dynamics between personal, interpersonal, and social systems, which shape how nurses develop knowledge, skills, and values. In the theory proposed by King [6], the personal system represents how individuals receive and process information, emphasizing individual perception as the key to understanding oneself and others.

In this system, personal perceived work value is a psychological state shaped by work, encompassing cognitive evaluation and positive emotions associated with the belief that work is valuable and that an individual plays a crucial role within the organization [7]. Work value is highly perceived when individuals recognize that their duties are meaningful, foster personal growth, and are acknowledged by colleagues and superiors. A previous study indicates that students typically evaluate nursing and their values positively based on theoretical knowledge before entering clinical practice [8]. Thus, understanding, performing, and applying nursing actions and their management enables students to develop core nursing competencies and provide appropriate patient care using new technologies aligned with the evolving hospital systems in the Fourth Industrial Revolution era. This process allows nursing students to achieve core-nursing competencies and increase their work value through successful task completion.

Furthermore, individual innovative behavior involves actions through which organizations and their members generate, promote, implement, and disseminate new ideas to achieve goals [9,10]. A previous study demonstrated that innovative behavior significantly influences job performance and, for clinical nurses, correlates strongly with nursing competency [11]. As nursing science advances with the Fourth Industrial Revolution, innovative behavior becomes increasingly essential, with evidence-based practice offering new problem-solving approaches [12]. Nurses demonstrate innovative behavior through multidisciplinary approaches to hospital challenges, addressing the growing demand for quality healthcare [11]. The Fourth Industrial Revolution requires major changes. In rapidly changing healthcare systems, the innovative thinking and behavior of nurses can drive adaptation and growth in response to environmental changes [1]. Therefore, personal innovative behavior is crucial for delivering personalized nursing care that meets the evolving demands of healthcare, moving beyond standard-

ized practices.

In the framework by King [6], the interpersonal system encompasses interaction, communication, transactions, roles, and stress. Spitzberg and Cupach [13] defined interpersonal competence as the ability to establish and maintain relationships with others. A previous study indicates that interpersonal factors among nursing students significantly influence their performance and development of nursing competencies, suggesting that interpersonal competence is a key variable in future core nursing competencies [14]. Therefore, examining how nursing students develop this competence through interactions with patients, caregivers, and healthcare professionals is crucial for understanding its impact on their professional growth.

The social system refers to an organization where individuals share common goals, interests, and values while interacting [6]. Organizational culture encompasses the shared values and beliefs that influence behaviors through formal and informal processes [15]. An innovative organizational culture transforms latent capabilities, changing the thinking, attitudes, and behaviors of members while driving environmental and organizational changes [16]. Park and Jang [17] demonstrated that an innovative organizational culture significantly enhances the self-leadership and creativity of nursing students while improving organizational trust and communication. Therefore, examining whether an innovation-driven organizational culture, compared to a traditional hierarchical culture, influences the future core competencies of nursing students is essential.

Previous studies on future core competencies have primarily explored traditional nursing competency factors from a limited perspective, often emphasizing practicing nurses in clinical settings. Additionally, discussions on future core competencies, including essential knowledge, attitudes, and skills, are occurring internationally [3]. However, systematic identification of factors across personal, interpersonal, and social systems within theoretical frameworks for future core competencies, especially for senior nursing students in the Fourth Industrial Revolution, remains limited. Therefore, this study aimed to examine the impact of work value and individual innovative behavior (personal factors), interpersonal competence (interpersonal factor) and adhocracy culture (systematic factors) on the future core competencies of senior nursing students, using King's Dynamic Interacting Systems Framework to inform nursing education program (Figure 1).

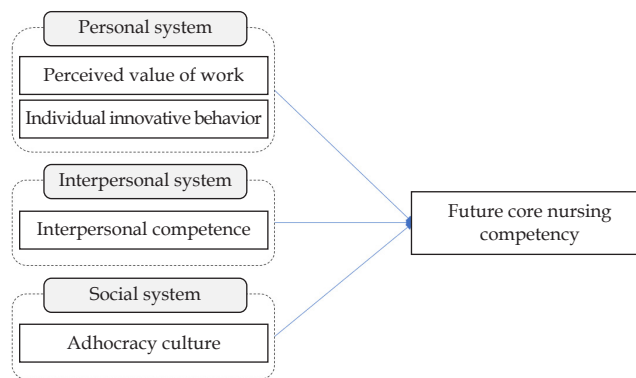


Figure 1. Conceptual framework of the study.

METHODS

Ethical statements: This study was approved by the Institutional Review Board of Chonnam National University in South Korea (IRB No. 1040198-240818-HR-133-02). Informed consent was obtained from all participants.

1. Study Design

This cross-sectional study aimed to identify factors influencing future core nursing competencies of senior nursing students. The reporting of this study followed the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines [18].

2. Participants

Overall, 150 third- and fourth-year nursing students from various regions of South Korea participated. The inclusion criteria were: (1) students who understood the study and independently completed the questionnaire and (2) students with clinical practice experience as part of the nursing curriculum. Participants confirmed their understanding of the study and voluntarily consented to participate.

The G*Power 3.1.9.7 program (Heinrich-Heine-Universität Düsseldorf) was used to calculate the minimum required sample size [19]. Using a medium effect size of 0.15, a significance level of .05, and a power of 0.80 for regression analysis, the minimum sample size was 135 participants. To account for a 10%–15% dropout rate [20], 150 questionnaires were distributed to students through an online platform (Google

Forms; Google LLC). The final sample comprised 150 participants.

3. Measurement Tools

1) Perceived value of work

To assess the perceived work value of students, we used a tool developed by Oh et al. [7], which includes 14 items across three domains: (1) work value recognition (three items), (2) self-worth recognition (three items), and (3) value-fulfillment emotions (eight items). Participants rated each item on a 5-point Likert scale, with responses ranging from 1 (not at all) to 5 (very much). Example items include “I feel valued in my work.” Higher scores indicate greater perceived work value. Oh et al. [7] reported a Cronbach’s α of .94 [7], while the Cronbach’s α in this study was .77.

2) Individual innovative behavior

We used the Individual Innovative Behavior Scale, developed by Kleysen and Street [21] and adapted by Kim [22] in 2014. The scale comprises 14 items, with participants rating each item on a 6-point Likert scale, ranging from 1 (not at all) to 6 (very much). Example items include “I take risks in support of new ideas.” Higher scores indicate stronger individual innovative behavior. Kim [22] reported a Cronbach’s α of .95, while this study reported a Cronbach’s α of .73.

3) Interpersonal competency

We used the Interpersonal Competence Scale developed by Buhrmester et al. [23] and adapted by Han and Lee [24]. This scale comprises 31 items across five areas: eight items on “initiating relationships,” three items on “self-disclosure,” seven items on “asserting displeasure with others’ actions,” seven items evaluating “empathy for others,” and six items assessing “managing interpersonal conflicts.” Participants rated each item on a 5-point Likert scale, ranging from 1 (not at all) to 5 (very much). Example items include “I suggest or ask new people to get together or do something together” Higher scores indicate stronger interpersonal competency. Han and Lee [24] reported a Cronbach’s α of .90, while it was .75 in this study.

4) Adhocracy culture

We used the Organizational Culture Assessment Instrument developed by Cameron and Quinn [25] and adapted by Lim and Lee [26]. The scale comprises 24 items across four

categories: six items each for “clan culture,” “adhocracy culture,” “hierarchical culture,” and “market culture.” This study focused on the six items for “adhocracy culture” based on previous studies [17]. Participants rated each item on a 5-point Likert scale, ranging from 1 (not at all) to 5 (very much), with example items such as “My organization values the innovative mindset of its members who are willing to take on new challenges.” Higher scores indicate a stronger endorsement of adhocracy culture. Lim and Lee [26] reported a Cronbach’s α of .82 [26], while it was .61 in this study.

5) Future nursing core competency

Kim [2] proposed core competencies for future nursing students derived from the Korea Accreditation Board of Nursing, 10 international healthcare professional organizations, and the 21st-century core competencies developed by Kwon and Kim [16] in 2023 for five international non-healthcare professional organizations. This tool comprises 18 items across four areas: three items on “personal thinking competencies,” seven items on “task competencies,” six items on “professionalism competencies,” and two items on “socio-emotional competencies.” Participants rated each item on a 5-point Likert scale, ranging from 1 (not at all) to 5 (very much), with an example item such as “I know about, integrate, and use new technologies such as big data analytics, artificial intelligence, etc.” Higher scores indicate better performance in future nursing competencies. Kwon and Kim [16] reported a Cronbach’s α of .83, while it was .86 in this study.

4. Data Collection

Data were collected in October 2024 through a nationwide nursing student community, cafes, and social media platforms. After obtaining approval from relevant managers and recruitment notices, the participation announcement, including a detailed information sheet and consent form, was shared along with the link to the online survey. Participants received details regarding the study objectives, methodology, confidentiality, voluntary participation, and potential risks and benefits. Only participants who voluntarily checked the consent box at the beginning of the survey were permitted to complete the 15–20-minute online self-report questionnaire. Furthermore, only students who indicated that they were in their third or fourth year of study were included in the final sample. Participants were offered a small token of appreciation.

5. Data Analysis

We analyzed the data using IBM SPSS Statistics ver. 29.0 (IBM Corp.). The mean and standard deviation (SD) were calculated for the general characteristics, perceived work value, individual innovative behavior, interpersonal competence, adhocracy culture, and future core nursing competencies. Additionally, an independent t-test and one-way analysis of variance were conducted to examine the differences in future core-nursing competencies based on general characteristics. Furthermore, Pearson's correlation coefficient was used to assess the correlation among primary variables and future core nursing competencies. Hierarchical multiple linear regression was used to identify any variables influencing future core nursing competencies.

RESULTS

1. Future Core Nursing Competencies according to General Characteristics

Table 1 presents the future core nursing competencies based on the general characteristics of participants. The average age of nursing students was 22.39 years (SD=1.00), with most (n=146; 97.3%) being women. Among them, 113 (75.3%) were enrolled in nursing colleges in Seoul or the metropolitan area, while 21 (14.0%) attended colleges in the Hoseo and Kwandong provinces. Among the participants, 94 (62.7%) were third-year students, while 56 (37.3%) were in their fourth year. Most participants (n=139; 92.7%) reported satisfaction with their major, and almost all (n=142; 94.6%) expressed satisfaction with their interpersonal relationships. More than half (n=86; 57.3%) had a grade point average (GPA) between 3.5 and 4.0 in the previous semester, while 52 (34.7%) reported a GPA above 4.0 on a scale of 4.5. Additionally, 96 participants (64.0%) cited aptitude and interest as their primary motivation for choosing their major.

Significant differences were observed in the future core competencies based on major satisfaction ($F=8.73, p<.001$). Participants who reported high satisfaction with their major demonstrated higher levels of core nursing competencies than those in the neutral group. Additionally, the satisfied group exhibited greater competencies than the neutral group. However, no significant differences were observed for other characteristics (Table 1).

2. The future core nursing competencies score of the participants

The future core nursing competencies score of the participants averaged 4.31 ± 0.59 on a 5-point Likert scale. The average scores for perceived value of work, interpersonal competencies, and adhocracy culture were 4.32 ± 0.32 , 4.31 ± 0.34 , and 4.36 ± 0.46 , respectively, on a 5-point Likert scale. Individual innovative behavior was rated at 5.34 ± 0.35 on a 6-point Likert scale (Table 2).

3. Correlation between Future Core Nursing Competencies and Related Factors

A positive correlation was observed between future core nursing competencies and the perceived value of work ($r=.33, p<.001$), individual innovative behavior ($r=.50, p<.001$), interpersonal competencies ($r=.51, p<.001$), and adhocracy culture ($r=.46, p<.001$) (Table 3).

4. Factors Affecting Future Core Competencies in Nursing Students

Hierarchical multiple regression analysis revealed that interpersonal competence and adhocracy culture significantly influenced the future core nursing competencies of nursing students. We controlled for the effects of general characteristics, which significantly influenced the outcome. A univariate analysis was conducted, followed by multiple regression analysis using variables that showed a significant relationship with future core nursing competency ($p<.05$) as independent variables. After verifying the assumptions of the error term, the Durbin-Watson test revealed no autocorrelation, with a value of 2.115. The tolerance range for the model was 0.26–0.93, and the variance inflation factor (VIF) was 1.07–4.08. No multicollinearity issues were detected, and the assumptions of normality and equal variance of residuals were satisfied. The tolerance limit of multicollinearity was ≥ 0.1 , while the VIF was < 10 for both models.

The regression model (Model 1), which included general characteristics of major satisfaction as a predictor, was statistically significant ($F=8.726, p<.001$) and explained 9.4% of the variance (adjusted $R^2=0.094$). In Model 1, major satisfaction was a significant predictor of future core nursing competencies ($\beta = -.33, p<.001$).

Finally, Model 4 included the primary variables of this

Table 1. Future core nursing competencies stratified by general characteristics (N=150)

Characteristic	No. (%)	Future core nursing competency	
		Mean ± SD	t/F (p)
Mean age (yr)	22.39 ± 1.00		
Age (yr)			
≤ 22	96 (64.0)	4.31 ± 0.59	0.16 (.856)
23–24	51 (34.0)	4.31 ± 0.59	
≥ 25	3 (2.0)	4.50 ± 0.50	
Gender			
Female	146 (97.3)	4.32 ± 0.59	1.08 (.299)
Male	4 (2.7)	4.00 ± 0.41	
School year			
3rd	94 (62.7)	4.28 ± 0.57	-0.85 (.288)
4th	56 (37.3)	4.37 ± 0.61	
Religion			
Yes	91 (60.7)	4.39 ± 0.54	2.01 (.285)
No	59 (39.3)	4.19 ± 0.64	
Nursing college region			
Seoul, metropolitan area	113 (75.3)	4.30 ± 0.55	
Hoseo, Kwandong province	21 (14.0)	4.43 ± 0.68	
Yeungnam province	10 (6.7)	4.30 ± 0.42	0.41 (.747)
Honam, Jeju province	6 (4.0)	4.17 ± 1.08	
Interpersonal relationship			
Highly satisfied	44 (29.3)	4.35 ± 0.49	0.30 (.828)
Satisfied	98 (65.3)	4.31 ± 0.63	
Neutral	7 (4.7)	4.14 ± 0.56	
Dissatisfied	1 (0.7)	4.5	
Highly dissatisfied	0 (0.0)	0	
Major satisfaction			
Highly satisfied ^a	69 (46.0)	4.37 ± 0.57	8.73 (< .001)
Satisfied ^b	70 (46.7)	4.36 ± 0.48	(a > c, b > c)
Neutral ^c	11 (7.3)	3.64 ± 0.90	
Dissatisfied	0 (0.0)	0	
Highly dissatisfied	0 (0.0)	0	
Previous grade			
≥ 4.0 < 4.5	52 (34.7)	4.38 ± 0.61	0.67 (.511)
≥ 3.5 < 4.0	86 (57.3)	4.28 ± 0.59	
≥ 3.0 < 3.5	12 (8.0)	4.21 ± 0.50	
≥ 2.5 < 3.0	0 (0.0)	0	
< 2.5	0 (0.0)	0	
Motivation for selecting a nursing college			
Matches aptitude	96 (64.0)	4.29 ± 0.61	1.56 (.202)
Based on high school grades	27 (18.0)	4.52 ± 0.49	
Recommended by parents	13 (8.7)	4.15 ± 0.55	
Employment prospects	14 (9.3)	4.25 ± 0.61	
Belief in nursing	0 (0.0)	0	
University life satisfaction			
Highly satisfied	50 (33.3)	4.45 ± 0.39	2.08 (.105)
Satisfied	95 (63.4)	4.26 ± 0.65	
Neutral	3 (2.0)	4.00 ± 0.50	
Dissatisfied	2 (1.3)	3.75 ± 1.06	
Highly dissatisfied	0 (0.0)	0	

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

study: the perceived value of work, individual innovative behavior, interpersonal competence, and adhocracy culture. Model 4 revealed that the following factors exhibited the greatest effect on future core nursing competencies, in descending order: interpersonal competence ($\beta = .32, p = .012$) and adhocracy culture ($\beta = .23, p = .010$). The model explained 30.9% of the variance in the future core nursing competencies of the nursing students (adjusted $R^2 = 0.309, F = 12.119, p < .001$) (Table 4).

DISCUSSION

This study aims to examine the factors influencing future core nursing competencies using King’s social dynamic framework. The mean score for future core nursing compe-

tencies was 4.31 (SD=0.59) out of 5, which was higher than the 3.47 (SD=0.54) reported by Kwon and Kim [16]. However, since their study focused on clinical nurses, a direct comparison may not be appropriate [16]. The difference in mean scores may be attributed to the exposure of the nursing students to more diverse learning environments in nursing curricula than nurses, which better equips them with the competencies required for the future healthcare landscape.

Kim et al. [27] highlight the need for competencies to address healthcare changes driven by the Fourth Industrial Revolution. Consequently, the Korean Accreditation Board of Nursing emphasizes future core nursing competencies in its nursing education evaluation standards. Future core nursing competencies varied based on major satisfaction, consistent with the findings of Park et al. [28], who examined factors influencing core nursing competencies in nursing students. A previous study reports a positive correlation between higher satisfaction with the nursing major and increased levels of future core nursing competencies. This effect is attributed to major satisfaction influencing key components of core nursing competencies—such as communication skills, problem-solving skills, and self-directed learning—through the mediation of critical thinking disposition, ultimately enhancing overall future core nursing competencies.

Table 2. Descriptive statistics of the future core nursing competencies score (N=150)

Variable	Mean ± SD
Future core nursing competency	4.31 ± 0.59
Perceived value of work	4.32 ± 0.32
Individual innovative behavior	5.34 ± 0.35
Interpersonal competence	4.31 ± 0.34
Adhocracy culture	4.36 ± 0.46

SD, standard deviation.

Table 3. Correlation between Future Core Nursing Competencies and Related Factors (N=150)

Variable	Perceived value of work	Individual innovative behavior	Interpersonal competency	Adhocracy culture	Future core nursing competency
Perceived value of work	1	0.73 (<.001)	0.65 (<.001)	0.49 (<.001)	0.33 (<.001)
Individual innovative behavior	0.73 (<.001)	1	0.81 (<.001)	0.61 (<.001)	0.50 (<.001)
Interpersonal competency	0.65 (<.001)	0.81 (<.001)	1	0.57 (<.001)	0.51 (<.001)
Adhocracy culture	0.49 (<.001)	0.61 (<.001)	0.57 (<.001)	1	0.46 (<.001)
Future core nursing competency	0.33 (<.001)	0.50 (<.001)	0.51 (<.001)	0.46 (<.001)	1

Table 4. Summary of hierarchical multiple regression analyses (N=150)

Variable	Model I					Model II					Model III					Model IV				
	B	SE	β	t	p	B	SE	β	t	p	B	SE	β	t	p	B	SE	β	t	p
(Constant)	4.36	0.07		65.39	<.001	0.63	0.73		0.86	.390	0.47	0.71		0.66	.509	0.40	0.70		0.57	.569
Major satisfaction ^{a)}	0.01	0.10	0.01	0.06	.956	0.03	0.09	0.02	0.33	.741	0.10	0.09	.09	1.15	.254	0.11	0.09	.10	1.30	.196
Major satisfaction ^{b)}	-0.73	0.18	-0.33	-4.02	<.001	-0.33	0.18	-0.15	-1.81	.073	-0.22	0.18	-0.10	-1.22	.224	-0.18	0.18	-.08	-1.02	.311
Perceived value of work						-0.16	0.19	-0.09	-0.84	.405	-0.24	0.19	-0.13	-1.27	.207	-0.28	0.19	-.15	-1.46	.145
Individual innovative behavior						0.82	0.18	0.50	4.66	<.001	0.42	0.23	0.25	1.85	.067	0.27	0.23	.16	1.19	.236
Interpersonal competence											0.61	0.22	0.36	2.81	.006	0.54	0.22	.32	2.54	.012
Adhocracy culture																0.29	0.11	.23	2.60	.010
R ²	0.106					0.268					0.306					0.337				
Adjusted R ²	.094 (F=8.726, p<.001)					.247 (F=13.242, p<.001)					.282 (F=12.682, p<.001)					.309 (F=12.119, p<.001)				

SE, standard error.

^{a)}Dummy variables: major satisfaction (very satisfied=1). ^{b)}Dummy variables: major satisfaction (average=1).

Additionally, professionalism competencies and the image of the nurse (cognitive factors), self-efficacy and college adjustment (affective factors), and career search behavior (psychomotor factors) positively influenced major satisfaction [29]. A stronger presence of these factors improves future core nursing competencies. Therefore, programs designed to strengthen these factors could further enhance core-nursing competencies.

In this study, interpersonal competence and adhocracy culture were identified as key factors influencing future core nursing competencies. Among these, interpersonal competence exhibited the strongest effect on senior nursing students. This finding is consistent with that of Cho et al. [14], Kim [30] regarding task competencies, which are subcomponents of future core nursing competencies. Therefore, the interpersonal competence of nursing students significantly influences their communication skills, caring efficacy, and stress management abilities, all of which are subcomponents of future core nursing competencies. Nursing students with strong interpersonal skills are more likely to engage in various interactions with their peers, facilitating their development of key competencies, such as communication, leadership, and problem-solving [14]. Enhancing the interpersonal competencies of nursing students is essential for strengthening their future core nursing competencies. Studies demonstrate that personality education programs, group counseling initiatives, and peer counselor training programs can improve interpersonal competence in university students [31]. Consequently, developing various programs to enhance the interpersonal competencies of nursing students who will become future nurses is essential.

Additionally, adhocracy culture was identified as the second most influential factor in shaping future core nursing competencies. Similarly, Park and Jang [17] report that adhocracy culture enhances creativity and self-leadership, recognizing it as a positive influence on organizational trust and communication. Therefore, implementing a system that structures rewards and recognition for creative ideas, establishes clear channels for open idea-sharing, and facilitates an environment where members value and encourage innovation could be essential strategies for cultivating an adhocracy culture. Additionally, efforts should focus on developing a flexible adhocracy culture that promotes change and recognizes the unique qualities of each nursing student. These efforts can create an environment where future generations can explore emerging nursing competencies by recognizing nurs-

ing as a dynamic and valuable discipline.

However, the perceived value of work did not significantly influence the future core nursing competencies of nursing students. While the perceived value of work is essential for developing nursing competencies and leadership skills, it may not directly affect future core nursing competencies. In contrast, Yoon and Woo [32] observed that the perceived value of work demonstrates a significant influence, while their study focused on nurses in hospitals rather than nursing students. Nursing competencies include practical skills such as professional development, ward task management, clinical judgment, and coping skills. This difference may be attributed to nurses being compensated for their work while nursing students are not, potentially hindering their sense of belonging. Oh and Jang [8], Oh [33] stated that work value is perceived highly when individuals recognize their work as meaningful, see it as a means of personal growth, and receive acknowledgment from colleagues and superiors. However, since the senior nursing students in this study are not yet affiliated with a hospital, do not engage in actual clinical practice, and are primarily influenced by their nursing education program, their perceived work value at this stage as prospective nurses may have had limited relevance to future core competencies. Therefore, in future studies, it is necessary to conduct qualitative research or use a research design that considers different mediating factors to analyze the relationship between perceived work value and future core competencies in more depth.

Furthermore, individual innovative behavior did not significantly influence the future core nursing competencies of the nursing students. As the participants in this study were nursing students with limited real clinical experience, they may have had limited opportunities to develop and implement creative and innovative ideas in a real-world setting, which demonstrate lower levels of innovative behavior in generating creative solutions and applying them in practice. This finding emphasizes the need for clinical training programs to facilitate and support innovation among nursing students. Future educational strategies should include project-based learning and simulation-based training in collaboration with clinical hospitals to offer nursing students authentic, real-world contexts in which to apply innovative thinking. Furthermore, the development of program that cultivate self-directed creativity will be essential in reinforcing the connection between individual innovative behavior and the advancement of future core nursing competencies.

CONCLUSION

In this study, the perceived value of work, individual innovative behavior, interpersonal competence, adhocracy culture, and future core nursing competencies are evaluated among senior nursing students. The findings indicate that interpersonal competencies and adhocracy culture significantly influence future core nursing competencies. To enhance these competencies among senior nursing students, ongoing program interventions should prioritize the development of interpersonal competency. Additionally, facilitating an adhocracy culture requires implementing structured systems that reward and recognize creative ideas, establishing clear channels for open idea-sharing, and promoting an environment where innovation is valued.

Considering the limitations of this study, the following recommendations are proposed to enhance the future core nursing competencies of nursing students. First, the assessments of future core nursing competency in this study rely on self-reported data collected through an online survey. There could be potential response bias inherent in self-reported questionnaires. The results may vary depending on factors such as the timing of data collection, the number of participants, and the survey platform used. Therefore, future surveys should be conducted across various sites and over an extended period with a larger sample size. In addition, to reduce this bias, it is necessary to pre-validate the validity and reliability of the survey instrument to minimize bias.

Furthermore, future studies should use a variety of assessment methods, such as behavior observation and interviews, in addition to self-report surveys to increase reliability. Additional qualitative research should be conducted in parallel to complement the in-depth information that cannot be obtained from self-report surveys.

Additionally, inconsistency analysis, response pattern and response time assessment using statistical techniques, should be employed to improve data reliability. Second, a direct comparison was not feasible due to the limited number of studies examining the selected variables, particularly since future core nursing competencies remain a relatively new concept.

To improve these areas, targeted programs should be developed. For example, interactive training sessions can improve communication and collaboration skills in clinical settings. Additionally, a mentoring system connecting senior and junior nursing students may facilitate knowledge ex-

change and interpersonal growth. To foster an adhocracy culture, implementing systems that recognize and reward creative ideas while ensuring transparent channels for students to openly share their thoughts is crucial. Efforts should focus on cultivating a culture that embraces change, allowing each student to express their unique strengths and perspectives. Furthermore, project-based learning in collaboration with clinical institutions can foster independent thinking and innovation, while leadership development programs can equip students with strategies for managing change. To evaluate the effectiveness of these initiatives, future research should incorporate cross-sectional studies. Additionally, longitudinal studies could examine how these competencies develop over time. Expanding the research is essential to build upon this study and offer a foundation for future investigations.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors. Methodology: all authors. Data collection: all authors. Formal analysis: IYC, CEP, JK. Writing-original draft: all authors. Writing-review & editing: IYC, CEP, JK. Final approval of published version: all authors.

Conflict of interest

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

Funding

None.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

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Child Health Nursing Research

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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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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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 TM, ®, 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
- Tables and Figures

Other elements

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/300090> 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-NonCommercial-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 ScienceCentral (<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 Ithenticate, 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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Title of the Manuscript : _____

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.

2. TITLE PAGE

- The title, a separate running title (if the main title exceeds 40 characters in English), author names, their affiliations, research design type, number of words in the English abstract and number of references, keywords (English), and any relevant statements of related funding or conflicts of interest, or mention of an associated graduate thesis are all presented.
- At the bottom of the title page, the email address, telephone, fax, and ORCID number, ResearcherID, plus the full postal address of the corresponding author, are provided.

3. ENGLISH ABSTRACT

- The abstract contains no more than 250 words with 5 or fewer keywords at the bottom.
- The abstract section contains the following in this order: title, author names with affiliations, body of abstract (Purpose, Methods, Results, and Conclusion), and keywords.
- The keywords are drawn from the MeSH list.
- The abstract does not include abbreviations, references, or diagrams.

4. MAIN TEXT

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