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Article

An Importance-Performance Analysis of Health Management Awareness of Korean Middle-School Students during the Post-COVID-19 Era Depending on Sex

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Abstract: This study aimed to conduct importance-performance analyses (IPAs) based on the perception of Korean middle-school students toward health management awareness during the post-coronavirus disease 2019 (COVID-19) era. Data were collected from 867 Korean middle-school students via online and offline surveys between May and June 2023. A frequency analysis, a reliability analysis, an IPA based on the entire target students, and an IPA depending on sex were carried out with the collected data, and they revealed the following. First, the IPA results regardless of sex indicated that four factors of the mental health were located in the third quadrant with one factor of the same variable in the fourth quadrant. The three factors of the disease management were located in the third quadrant. As for physical activity, two factors were located in the first quadrant, one in the second quadrant, and one in the third quadrant. As for sleep management, two factors were located in the second quadrant, one in the third quadrant, and one in the first quadrant. As for the eating management, two factors were located in the third quadrant, and one in the fourth quadrant. As for the social distancing variable, all four factors were located in the third quadrant. As for the hygiene management, two factors were located in the first quadrant, one in the third quadrant, and one in the fourth quadrant. Furthermore, the IPA results indicated gender differences in regular sports and vigorous movement activities associated with the physical activity. Additionally, a gender difference was observed in regular diet associated with the eating management. This study proposed possible measures for encouraging adolescents to recognize the importance of health and increase their health-related performance during the COVID-19 endemic phase.

Keywords: COVID-19 endemic phase; Korean middle school students; Health awareness; Importance-performance analysis (IPA)

1. Introduction

Since the World Health Organization (WHO) declared the end to coronavirus 2019 (COVID-19) as a public health emergency in May 2022, the South Korean government has relaxed COVID-19 guidelines by implementing autonomous social distancing. Over the past two years, the COVID-19 pandemic has posed significant challenges across various fields, including the social, economic, cultural, educational, and industrial sectors. Beyond such difficulties, Koreans have adopted to changes and realized the value of daily life. Poor physical activity due to a prolonged sedentary lifestyle, among other problems caused by the COVID-19 pandemic, may contribute to several mental

and physical diseases. In particular, multiple reports and media have warned against the consequences of insufficient physical activity in adolescents [1].

A previous study on physical activity among adolescents during the COVID-19 pandemic indicated that it was restricted by the contactless school-education system implemented during the crisis [2]. Given their status as minors, adolescents were subject to greater social distancing measures than adults to protect them from the pandemic. Consequently, they reported significant negative changes such as depression, anxiety, social isolation, maladjustment, stress, skipping breakfast, and insufficient sleep during the past two years of the COVID-19 pandemic [3,4,5]. It has also been reported that changes brought about by the COVID-19 pandemic, such as lifestyle adjustments, inappropriate nutritional conditions, addiction to media, and reduced physical activity, have negatively affected adolescents' physical and mental health [6].

Another study on the physical activity of adolescents during the COVID-19 pandemic identified a difference between therapeutic and preventative health factors, reporting significantly lower levels of importance and performance of physical activities (Lee et al., 2021). The COVID-19 pandemic has also resulted in a reduction in adolescent physical activity [7] and an increased rate of obesity [8]. Regarding the physical activities of adolescents, sedentary activities have increased, whereas medium- and high-intensity physical activities have decreased [9,10]. Furthermore, adolescents experience a decrease in health-related quality of life (HRQoL) [11] and a negative influence on their living patterns due to COVID-19 [12,13].

As indicated in the aforementioned studies, reduced physical activity in adolescents leads to poor health conditions [14]. Specifically, the aggravated health conditions in adolescents during the COVID-19 pandemic was brought about by the closure of schools and the implementation of contactless classes [14]. The new operation mode of school education during the COVID-19 pandemic negatively impacted adolescents' physical health, learning of community-related capabilities, and academic achievement. Additionally, several measures of adolescents' emotional health showed low values [15].

Recently, the central and local governments in South Korea have implemented diverse physical exercise programs for citizens who lacked physical activity during the pandemic to restore their health [16]. Especially, the Ministry of Education and schools have striven to promote the physical activity of adolescents [18, 19] based on reports [7, 17] of insufficient physical activities among adolescents.

Under these circumstances, this study recognizes the need to examine the health conditions of adolescents, implement policies that promote physical education in schools, and encourage adolescent health recovery. Analysis of adolescent health management is expected to provide essential data for the design and implementation of long-term health recovery programs. Thus, this study examined the perceptions of middle-school students living in the capital area of South Korea toward health management awareness and conducted an importance-performance analysis (IPA) of their health-management behaviors. Based on the analysis, it identified tendencies related to health management awareness and ultimately derived implications for physical education. Specifically, the results of this study were compared with those of existing studies on the health management awareness of Korean middle-school students during the initial and prolonged COVID-19 pandemic phases to investigate the current conditions and tendencies of their health management awareness.

Furthermore, this study analyzed the perception of middle-school students toward health and the characteristics of their physical activities [22, 23, 24] according to sex, given that multiple studies have reported sex as a core variable for understanding the characteristics of adolescents' physical activities [20, 21]. Additionally, this study was conducted as follow-up research on the health management and physical activities of adolescents during the COVID-19 pandemic. Therefore, this study is anticipated to offer valuable data that can be used to identify the current conditions and tendencies of health management among Korean middle-school students during the COVID-19 pandemic and endemic phases.

2. Methods

2.1. Participants

This study established middle-school students living in South Korea as the population and used convenience sampling, a non-probability sampling technique, to select participants. Of the 882 respondents, 15 who indiscriminately marked their answers or had unclear answers were excluded. Consequently, this study selected 867 Korean middle school students in their first, second, or third year and aged 13–15 years. The selected participants completed online and offline surveys based on Google Forms between May and June 2023. Table 1 presents the demographic characteristics of participants.

Table 1. The demographic characteristics of the research targets.

	Classification	Frequency	Percentage(%)
Gender	Male	464	53.5
	Female	403	46.5
	Total	867	100

2.2. Instruments

This study selectively used scales proposed by existing studies that were consistent with its research purposes. General characteristics of the participants were examined based on sex, experience with COVID-19 infection, and wearing of a facial mask during physical activities, which were measured as categorical variables. To measure the participants' perception toward health, this study adjusted scales, the validity and reliability of which were confirmed by Barakat et al. [26], Jones [27], and Lee et al. [28], based on a study on health perception scales conducted by Ware [25], in accordance with the research objectives, and used them for analysis. This study used seven variables: mental health, disease management, physical activity, sleep management, eating management, hygiene management, and social distancing. Questionnaire items were rated on a five-point Likert scale to calculate the scores for each item independently.

2.3. Reliability of Instruments

This study used Cronbach's α , a measure used to verify the internal consistency of items, via an exploratory factor analysis (EFA) to confirm the reliability of scales adopted. The results of the analysis are listed in Table 2. As observed in a previous study, seven variables with a factor loading of 0.5 or higher were derived. These factors are named eating management, disease management, mental health, physical activity, sleep management, hygiene management, and social distancing. The calculated Cronbach's α ranged from .728 to .852, which ensured adequate reliability of the scales used in this study [29]. The calculation results are presented in Tables 2.

Table 2. EFA and reliability analysis.

Variable	Mental health	Sleep management	Hygiene management	Physical activity	Social distancing	Disease management	Eating Management
interest in life	0.812	0.170	0.134	0.088	0.079	0.108	0.106
happiness	0.797	0.174	0.141	0.063	0.054	0.071	0.085

formation of a reliable relationship	0.724	0.128	0.117	0.151	-0.065	0.222	0.041
belongingness	0.722	0.118	0.089	0.098	-0.105	0.147	0.043
meaning of life	0.675	0.082	0.061	0.193	0.103	0.154	0.124
appropriate sleep amount	0.140	0.815	0.036	0.065	0.093	0.060	0.144
regular sleep activity	0.116	0.725	0.068	0.155	0.133	0.095	0.149
appropriate sleep quality	0.196	0.706	0.158	0.178	0.140	0.089	0.130
stable sleep environment	0.151	0.645	0.021	0.021	-0.002	0.100	0.120
habitual hygienic activity	0.123	0.002	0.832	0.085	0.072	0.050	0.145
mandatory hygienic practice	0.146	0.028	0.793	0.039	0.026	0.024	0.129
activity of preventing infection of others	0.119	0.038	0.651	0.096	0.072	0.172	-0.004
activity of preventing self-infection	0.072	0.190	0.632	0.122	0.119	0.137	0.021
vigorous movement activity	0.192	0.099	0.067	0.823	-0.061	0.057	0.064
regular sports activity	0.172	0.113	-0.007	0.795	-0.091	0.052	0.027
daily gymnastic activity	0.059	-0.041	0.185	0.670	0.081	0.075	0.178
regular physical activity	0.082	0.189	0.111	0.637	0.046	0.021	0.039

practice of distancing	0.053	0.131	0.121	0.050	0.828	0.084	-0.001
restricted access to multi-use facilities	0.039	0.086	-0.002	-0.050	0.751	0.025	0.100
wearing of a facial mask in multi-use facilities	-0.019	0.006	-0.012	-0.123	0.724	0.017	0.100
use of a hand sanitizer	-0.038	0.112	0.292	0.186	0.626	0.117	0.009
prescription management	0.233	0.085	0.134	0.082	0.087	0.812	0.132
vaccination	0.161	0.108	0.148	0.046	0.087	0.785	0.176
prevention of diseases	0.258	0.170	0.128	0.078	0.062	0.752	0.098
appropriate diet amount	0.161	0.157	0.128	0.143	0.106	0.100	0.773
ideal eating habits	0.095	0.148	0.126	0.154	0.073	0.190	0.766
regular diet	0.097	0.374	0.042	0.014	0.072	0.126	0.642
Eigenvalue	3.219	2.570	2.479	2.452	2.334	2.129	1.862
Variance (%)	11.923	9.517	9.183	9.080	8.643	7.887	6.897
Cumulative (%)	11.923	21.440	30.623	39.703	48.347	56.233	63.130
Cronbach's α	0.852	0.787	0.752	0.761	0.739	0.814	0.728

2.4. Procedures and Data Analysis

SPSS (version 18.0; IBM Corp., Armonk, NY, USA) was used to analyze the collected data. The specific analysis procedures were as follows: First, EFA and reliability analysis were conducted based on an adjusted IPA. Second, an independent sample t-test was conducted to examine differences in the performance of Korean middle-school students in terms of health management awareness by sex. Third, two separate IPAs were performed—one without considering sex and the other specifically by sex—to assess the importance and performance of each variable. To ensure research ethics, this study received approval from the Institutional Review Board (IRB) of Wonkwang University (WKIRB-202306-SB-041).

3. Results

3.1. Relative IPA of Health Management Awareness of Korean Middle-School Students Regardless of Sex

The median (0.191) and mean (3.590) values of the average relative performance were established as standard nodes to form an IPA matrix based on the perceptions of Korean middle-school students toward health management according to the factors. The calculation results are presented in Tables 3–4 and Figure 1.

Table 3. The values of relative importance and performance of health management awareness of Korean middle-school students regardless of sex.

Variables		Importance	Performance
Mental health	Happiness	0.238	3.950
	interest in life	0.225	3.854
	Belongingness	0.244	4.273
	formation of a reliable relationship	0.257	4.119
	meaning of life	0.157	3.734
Disease management	prevention of diseases	0.216	3.980
	prescription management	0.235	4.016
	vaccination	0.229	3.925
Physical activity	regular sport activity	0.297	3.648
	daily gymnastic activity	0.227	3.459
	vigorous movement activity	0.308	3.727
	regular physical activity	0.166	3.253
Sleep management	regular sleep activity	0.196	3.036
	appropriate sleep quality	0.228	2.947
	appropriate sleep amount	0.161	3.287
Eating management	stable sleep environment	0.223	3.905
	regular diet	0.134	3.532
	ideal eating habits	0.169	3.442
Social distancing	appropriate diet amount	0.123	3.833
	wearing of a facial mask in multi-use facilities	0.077	3.317
	restricted access to multi-use facilities	0.087	2.817
	practice of distancing	0.073	2.504
Hygiene management	use of a hand sanitizer	0.136	2.535
	activity of preventing infection of others	0.158	4.107
	activity of preventing self-infection	0.155	3.346
	habitual hygienic activity	0.241	4.130
	mandatory hygienic practice	0.195	4.255
Average		0.191	3.590

The details of the four quadrants of the IPA matrix for Korean middle school students, regardless of sex, are as follows:

In the first quadrant (keep up with good work), items showed high importance and performance, requiring maintenance of their current conditions. This quadrant comprised the following factors: happiness, interest in life, belongingness, and formation of a reliable relationship within the mental health variable; prevention of diseases, prescription management, and vaccination within the disease management variable; regular sports and vigorous movement activities within the physical activity variable; a stable sleep environment within the sleep management variable; and habitual hygienic activity and mandatory hygienic practice within the hygiene management variable.

In the second quadrant (concentrate here), the items exhibited high importance and low performance, requiring urgent performance improvement. This quadrant comprised the following factors: daily gymnastic activity within the physical activity variable; regular sleep activity and appropriate sleep quality within the sleep management variable.

In the third quadrant (low priority), the items showed low importance and performance, requiring greater effort than that exhibited currently. This quadrant includes the following factors: regular physical activity within the physical activity variable; appropriate sleep amount within the sleep management variable; regular diet and ideal eating habits for the eating management variable; wearing of a facial mask in multi-use facilities, restricted access to multi-use facilities, practice of distancing, and use of a hand sanitizer for the social distancing variable; and preventing self-infection within the hygiene management variable.

In the fourth quadrant (possible overkill), items showed low importance and high performance, indicating that excessive effort was made on these items despite their low importance. This quadrant comprises the following factors: meaning of life within the mental health variable, appropriate diet amount for the eating management variable, and preventing infection of others within the hygiene management variable.

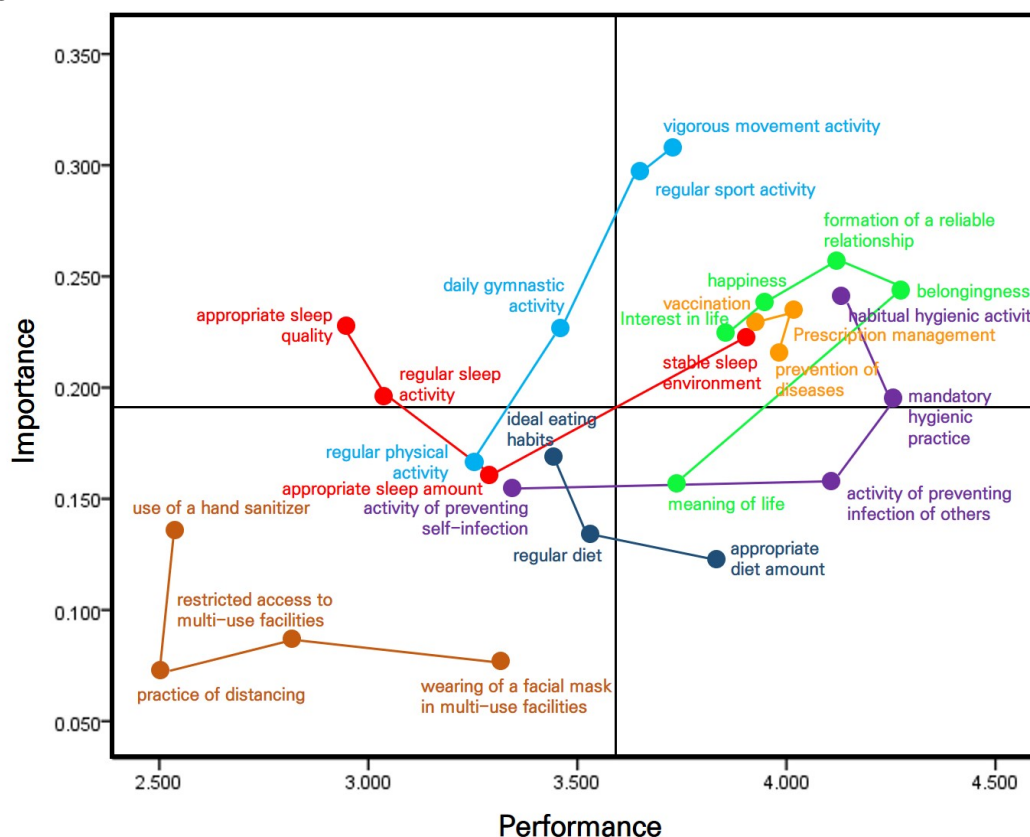


Figure 1. The IPA matrix based on the perception of Korean middle school students toward health management awareness regardless of sex.

Table 4. The quadrants of the IPA matrix based on the perception of Korean middle-school students toward health management awareness regardless of sex.

Quadrant	Criteria	Variables Distribution
Quadrant I	Importance ↑	happiness, interest in life, belongingness, formation of a reliable relationship, prevention of diseases, prescription management, vaccination, regular sport activity, vigorous movement activity, stable sleep environment, habitual hygienic activity, mandatory hygienic practice
	Performance ↑	
Quadrant II	Importance ↑	daily gymnastic activity, regular sleep activity, appropriate sleep quality
	Performance ↓	
Quadrant III	Importance ↓	regular physical activity, appropriate sleep amount, regular diet, ideal eating habits, wearing of a facial mask in multi-use facilities, restricted access to multi-use facilities, practice of distancing, use of a hand sanitizer, activity of preventing self-infection
	Performance ↓	
Quadrant IV	Importance ↓	meaning of life, appropriate diet amount, activity of preventing infection of others
	Performance ↑	

3.2. Analysis of a Difference in Performance Regarding the Perception of the Target Middle School Students toward Health Management Awareness by Sex

An independent sample t-test was conducted to examine differences in performance regarding the perception of middle-school students regarding health management awareness by sex. The test results indicated statistically significant differences in physical activity, sleep management, and hygiene management. Male students performed better than female students in physical activity and sleep management variables. Whereas, female students performed better in hygiene management. The calculation results are presented in Table 5.

Table 5. A difference in performance of Korean middle-school students for health management awareness by sex.

Categories	Gender	N	M	SD	SE	t	p
Mental health	Male	464	4.012	0.750	0.035	1.103	.270
	Female	403	3.956	0.746	0.037		
Disease management	Male	464	3.971	0.834	0.039	-.126	.900
	Female	403	3.978	0.830	0.041		
Physical activity	Male	464	3.649	0.959	0.045	4.331	.000***
	Female	403	3.375	0.898	0.045		
Sleep management	Male	464	3.439	1.000	0.046	4.669	.000***
	Female	403	3.127	0.964	0.048		
Eating management	Male	464	3.636	0.965	0.045	1.147	.252
	Female	403	3.562	0.928	0.046		

Social distancing	Male	464	2.817	0.983	0.046	.802	.423
	Female	403	2.766	0.919	0.046		
Hygiene management	Male	464	3.910	0.803	0.037	-2.058	.040*
	Female	403	4.017	0.723	0.036		

***P>.001. *P>.05,

3.3. Relative IPA of Health Management Awareness of Korean Middle School Students by Sex

To form an IPA matrix based on the perceptions of Korean middle school students regarding health management awareness according to various factors, the following standards were applied: For male students, the median (0.201) and the median (3.6353) values of the average relative importance were established as standard nodes. For female students, the median (0.201) and the median (3.538) values of the average relative importance were established as standard nodes. The calculated results are presented in Tables 6–7 and Figure 2.

Table 6. The values of relative importance and performance based on the perception of Korean middle-school students toward health management awareness by sex.

Variables	Male students		Female students	
	Importance	Performance	Importance	Performance
Happiness	0.278	3.976	0.278	3.921
interest in life	0.263	3.894	0.263	3.806
Mental health	0.289	4.300	0.289	4.243
belongingness	0.289	4.300	0.289	4.243
formation of a reliable relations hip	0.336	4.110	0.336	4.129
meaning of life	0.166	3.780	0.166	3.680
Disease management	0.204	3.996	0.204	3.963
prevention of diseases	0.204	3.996	0.204	3.963
prescription management	0.259	4.002	0.259	4.032
vaccination	0.191	3.914	0.191	3.938
regular sport activity	0.340	3.961	0.340	3.288
Physical activity	0.233	3.420	0.233	3.504
daily gymnastic activity	0.233	3.420	0.233	3.504
vigorous movement activity	0.328	3.894	0.328	3.533
regular physical activity	0.171	3.321	0.171	3.174
regular sleep activity	0.191	3.175	0.191	2.876
Sleep management	0.247	3.112	0.247	2.757
appropriate sleep quality	0.247	3.112	0.247	2.757
appropriate sleep amount	0.174	3.491	0.174	3.052
stable sleep environment	0.278	3.978	0.278	3.821
Eating management	0.122	3.688	0.122	3.352
regular diet	0.122	3.688	0.122	3.352
ideal eating habits	0.199	3.412	0.199	3.476
appropriate diet amount	0.121	3.810	0.121	3.859
Social distancing	0.037	3.321	0.037	3.313
wearing of a facial maskin mul ti-use facilities	0.037	3.321	0.037	3.313

	restricted access to multi-use facilities	0.055	2.879	0.055	2.744
	practice of distancing	0.046	2.556	0.046	2.444
	use of a hand sanitizer	0.080	2.513	0.080	2.561
	activity of preventing infection of others	0.207	4.086	0.207	4.132
Hygiene management	activity of preventing self-infection	0.178	3.336	0.178	3.357
	habitual hygienic activity	0.239	4.056	0.239	4.216
	mandatory hygienic practice	0.202	4.162	0.202	4.362
	Average	0.201	3.635	0.201	3.538

The details of the four quadrants of the IPA matrix based on Korean middle-school students by sex are as follows:

In the first quadrant (keep up the good work), where items show high importance and performance and require the maintenance of their current conditions, the following factors are displayed regardless of sex: happiness, interest in life, belongingness, and formation of a reliable relationship within the mental health variable; prevention of diseases and prescription management within the disease management variable; stable sleep environment within the sleep management variable; activity of preventing infection of others; habitual hygienic activity; and mandatory hygienic practice within the hygiene management variable. It should be noted that this quadrant contains factors specific to male students, such as regular sports and vigorous movement activities, within the physical activity variable.

In the second quadrant (possible overkill), where the items included show high importance and low performance and require urgent performance improvement related to them, the following factors are displayed regardless of sex: daily gymnastic activity within the physical activity variable and appropriate sleep quality within the sleep management variable. It should be noted that this quadrant contains factors specific to female students, such as regular sports and vigorous movement activities, within the physical activity variable.

In the third quadrant (low priority), where items showed low importance and performance and required greater effort than the present efforts, the following factors were displayed regardless of sex: regular physical activity within the physical activity variable; regular sleep activity and appropriate sleep amount within the sleep management variable; ideal eating habits for the eating management variable; wearing of a facial mask in multi-use facilities, restricted access to multi-use facilities, practice of distancing, and use of a hand sanitizer for the social distancing variable; and preventing self-infection within the hygiene management variable. It should be noted that this quadrant contained factors specific to female students, such as a regular diet, for the eating management variable.

In the fourth quadrant (concentrate here), where items show low importance and high performance and receive excessive effort for performance despite their low importance, the following factors are displayed regardless of sex: meaning of life within the mental health variable, vaccination within the disease management variable, and appropriate diet amount within the eating management variable. It should be noted that this quadrant contained factors specific to male students, such as a regular diet, for the eating management variable.

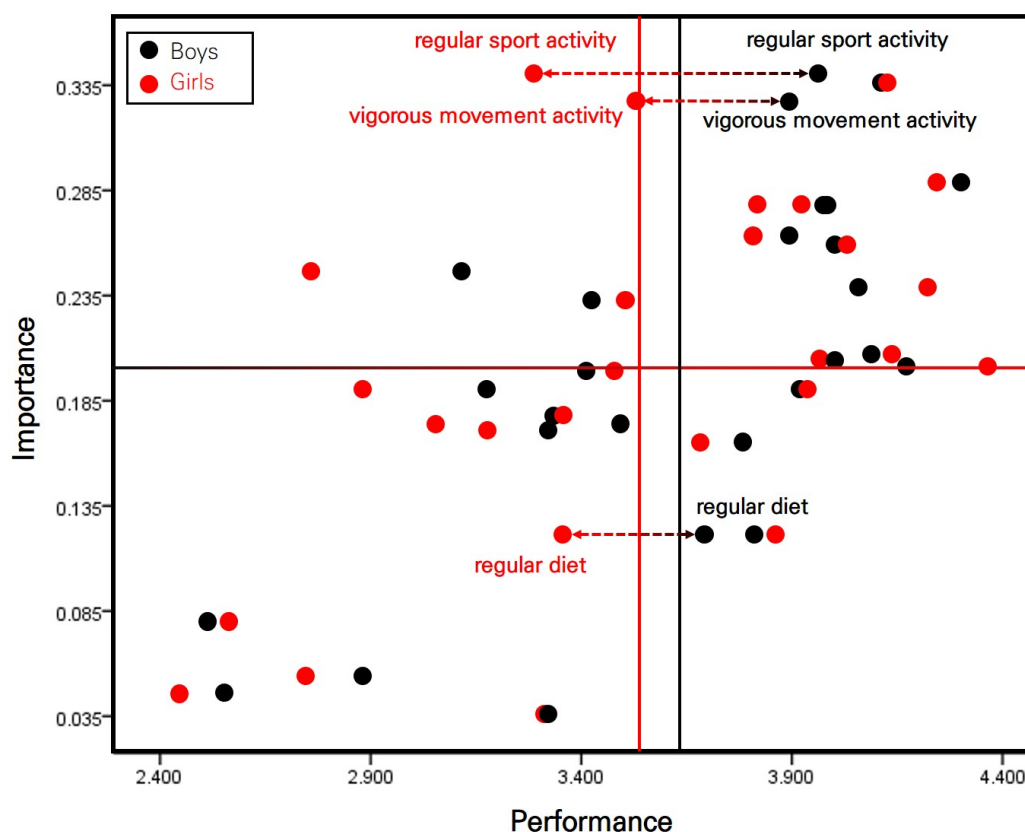


Figure 2. The IPA matrix based on the perception of Korean middle-school students toward health management awareness by sex.

Table 7. The four quadrants of the IPA matrix based on the perception of Korean middle-school students toward health management awareness by sex.

Quadrant	Criteria	Gender	Variables Distribution
Quadrant I	Importance ↑ Performance ↑	Boys	happiness, interest in life, belongingness, formation of a reliable relationship, prevention of diseases, prescription management, regular sport activity, vigorous movement activity, stable sleep environment, activity of preventing infection of others, habitual hygienic activity, mandatory hygienic practice
		Girls	happiness, interest in life, belongingness, formation of a reliable relationship, prevention of diseases, prescription management, stable sleep environment, activity of preventing infection of others, habitual hygienic activity, mandatory hygienic practice
Quadrant II	Importance ↑ Performance ↓	Boys	daily gymnastic activity, appropriate sleep quality
		Girls	regular sport activity, daily gymnastic activity, vigorous movement activity, appropriate sleep quality

Quadrant III	Importance ↓ Performance ↓	Boys	regular physical activity, regular sleep activity, appropriate sleep amount, ideal eating habits, wearing of a facial mask in multi-use facilities, restricted access to multi-use facilities, practice of distancing, use of a hand sanitizer, activity of preventing self-infection
		Girls	regular physical activity, regular sleep activity, appropriate sleep amount, regular diet, ideal eating habits, wearing of a facial mask in multi-use facilities, restricted access to multi-use facilities, practice of distancing, use of a hand sanitizer, activity of preventing self-infection
Quadrant IV	Importance ↓ Performance ↑	Boys	meaning of life, vaccination, regular diet, appropriate diet amount
		Girls	meaning of life, vaccination, appropriate diet amount

4. Discussion

This study conducted IPAs on health management awareness of 867 middle school students living in the capital area of South Korea during the endemic phase of COVID-19. Specifically, the IPAs were carried out regardless of sex and by sex. The analysis revealed the following findings:

The results of comparing the IPA outcomes on the perception of Korean middle-school students regarding the importance of health management awareness and their practice of such behaviors obtained during the current COVID-19 endemic phase with those obtained during the COVID-19 pandemic phase are as follows:

First, Korean middle-school students placed high importance on the following factors and performed well during the COVID-19 endemic phase: happiness, interest in life, belongingness, the formation of a reliable relationship, disease prevention, prescription management, and vaccination. Regular sports activity, vigorous movement activity, stable sleep environment, habitual hygienic activity, and mandatory hygienic practice. These factors are displayed in the first quadrant (keep up good work) of the IPA matrix, indicating that the performance related to them has been satisfactory, and that the maintenance of their current conditions will result in consistently positive results [30]. In the early phase of the COVID-19 pandemic, Korean middle-school students placed high importance on the variables of disease management, hygiene management, and mental health and exhibited high performance related to these variables [12]. The three variables were located in the first quadrant of the IPA matrix even during the prolonged COVID-19 pandemic phase [31], and this trend was maintained in the COVID-19 endemic phase. Interestingly, the first quadrant of the IPA matrix, focusing on the COVID-19 endemic phase, contains the factors of regular sports activity and vigorous movement activity, unlike the early and prolonged COVID-19 pandemic phases. This study found that this difference resulted from the full-scale resumption of offline classes in schools and the effects of policies promoting physical education in schools conducted by the Ministry of Education, Offices of Education, and schools to encourage adolescents' health recovery.

Second, Korean middle-school students placed high importance on daily gymnastic activity, regular sleep activity, and appropriate sleep quality but exhibited low performance related to these factors during the COVID-19 endemic phase. These factors are located in the second quadrant of the IPA matrix, where the included items show high importance and low performance, and require immediate performance improvement [30]. In contrast, these factors did not appear in the second quadrant of the IPA matrix, which focused on the early and prolonged COVID-19 pandemic phases.

Nevertheless, improvements in adolescent performance related to sleep management and physical activity were required during the COVID-19 pandemic period [7, 17]. In particular, the excessive exposure of adolescents to digital media is the main cause of their failure in sleep management [32]. In other words, adolescents recognized the importance of sleep management but exhibited low performance during the COVID-19 endemic phase owing to the persistent influence of excessive exposure to digital media and development of undesirable sleep patterns during the COVID-19 pandemic period.

Third, Korean middle-school students placed low importance on the following factors and exhibited low performance during the COVID-19 endemic phase: regular physical activity, appropriate sleep amount, regular diet, ideal eating habits, wearing a facial mask in multi-use facilities, restricted access to multi-use facilities, practice of distancing, use of a hand sanitizer, and activity to prevent self-infection. These factors are located in the third quadrant of the IPA matrix, where the included items show low importance and performance and require long-term effort for improvement [30]. During the early and prolonged COVID-19 pandemic phases, Korean middle school students placed low importance on sleep management, eating management, and physical activity and exhibited poor performance [12, 33]. This trend was partially maintained during the COVID-19 endemic phase. However, it is intriguing to note that the third quadrant of the IPA matrix contains the social distancing variable during the COVID-19 endemic phase and not during the early and prolonged COVID-19 pandemic phases. This difference resulted from a natural shift in the perception and behavioral patterns of Korean middle-school students who witnessed the end of social distancing and became aware of the characteristics of weak Omicron variants.

Fourth, Korean middle-school students placed low importance on the following factors but exhibited high performance during the COVID-19 endemic phase: meaning of life, appropriate diet amount, and preventing infection of others. These factors are located in the fourth quadrant of the IPA matrix, where the included items show low importance and high performance, and receive excessive effort for performance despite their low importance [30]. By contrast, these factors were not found in the fourth quadrant of the IPA matrix during the early and prolonged COVID-19 pandemic phases [12, 31]. Based on these results, it can be inferred that Korean middle-school students who continuously practiced health management awareness related to the meaning of life were affected by a sense of freedom from the COVID-19 pandemic period, appropriate diet amounts encouraged by the resumed provision of school meals, and preventing infection of others previously learned during the COVID-19 pandemic period.

In addition, the following factors of health management awareness of Korean middle school students during the COVID-19 endemic phase exhibited low performance: daily gymnastic activity, regular physical activity, regular diet, ideal eating habits, regular sleep activity, appropriate sleep quality, and appropriate sleep amount. Thus, efforts should be made to improve performance related to these factors. In the COVID-19 endemic phase, schools actively encouraged physical activity using a policy-based approach and resumed a school lunch system. Therefore, there is a need to provide students with proactive guidance on daily, regular, and ideal health-management practices related to physical activity, eating, and sleep at the family level. Furthermore, social distancing was observed in the third quadrant, showing low importance and performance during the COVID-19 endemic phase. This suggests that Korean middle school students were accurately aware of the current COVID-19 endemic phase and that they precisely reflected on the present conditions in evaluating the importance of social distancing and managing performance related to this variable.

Moreover, the comparison of Korean middle-school students' perception regarding health management awareness during the COVID-19 endemic by sex indicated differences in regular sports and vigorous movement activities within the physical activity variable. Additionally, there was a difference in the regular diet for eating management variable between male and female students. During the early and prolonged COVID-19 pandemic phases, both male and female students have exhibited low performance in terms of physical activity and eating habits [5]. However, male students actively practiced regular sports activities, vigorous movement activities, and regular diet during the COVID-19 endemic phase. In contrast, female students maintained a low performance related to

these factors during the COVID-19 endemic phase. It is difficult to say that this phenomenon was caused by learning effects generated during the COVID-19 pandemic, given the absence of reports on educational inequality between men and women in online classes and mixed classes (online and offline learning) during the COVID-19 pandemic period. Rather, this phenomenon may be attributed to a fundamental difference in resilience related to physical activity and eating habits between male and female students or the active receptivity of male students to school-based health recovery programs compared with that of female students during the COVID-19 endemic phase. To address this issue, a thorough investigation should be conducted to examine whether gender inequality occurs when implementing health recovery programs in schools and taking care of students at home.

5. Conclusions

This study conducted IPAs based on Korean middle-school students during the COVID-19 endemic phase to examine the perception of Korean middle-school students toward health management awareness by sex. To this end, Korean middle-school students participated in online and offline surveys between May and July 2023. The following outcomes were obtained by analyzing the survey results:

The analysis of the IPA matrix based on Korean middle school students, regardless of sex, indicate that performance for regular sports activity and vigorous movement activity within the physical activity variable increased compared to that during the COVID-19 pandemic period. However, factors related to social distancing exhibited lower importance and performance during the COVID-19 pandemic period. The analysis of the IPA matrix by sex revealed that male students exhibited improved performance in regular sports activity, vigorous movement activity, and regular diet compared to female students during the COVID-19 endemic phase and not during the COVID-19 pandemic period, when both male and female students exhibited low performance for the same factors.

Based on the analysis, this study presents the following conclusions.

First, health recovery programs in schools during the COVID-19 endemic phase had positive effects on middle school students in terms of physical activity, eating habits, and mental management. However, as they showed low performance in daily and regular physical activity, sleep activity, and eating management at home, measures for solving this issue should be developed. Furthermore, differences in physical activity and eating habits were observed between male and female students during the COVID-19 pandemic. These results suggest the need to constantly promote physical activity in female students and provide them with education on eating habit management. Additionally, it is necessary to monitor the gender inequality between male and female students.

In future research, various health management analyses based on a wider range of participants during the COVID-19 endemic phase should be conducted. Moreover, the findings of this study can be a comparison point for future studies from the perspectives of country, region, race, and gender equality. Qualitative research using in-depth interviews or participant observations can be implemented to examine those currently in the recovery stage.

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