

Article

An IPA of Health Perceptions among Korean and Japanese adolescents during the prolonged COVID-19 pandemic

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Abstract: This study aims to comparatively analyze the importance and performance of the health of Korean and Japanese adolescents during the prolonged coronavirus disease 2019 (COVID-19) pandemic. Data were collected from 1,341 Korean and Japanese adolescents in September 2021 through online and offline surveys. The collected data were analyzed with frequency analysis, reliability testing, t-test, and importance-performance analysis (IPA). The following results were obtained. First, adolescents in the two countries perceive various factors about health as important during the COVID-19 pandemic, but their performance is weak compared to their perceived importance. Second, Korean adolescents had greater perceived importance for all factors of health perception compared to their Japanese counterparts. Third, the difference in performance between Korean and Japanese adolescents was especially evident for hygiene management, and there were significant differences in performance in disease management and physical activity. Fourth, in quadrant 4 of the IPA matrix, there were similarities and differences in a particular factor of health perception between Korean and Japanese adolescents. Based on these results, we proposed measures to emphasize the importance of health and enhance performance among Korean and Japanese adolescents.

Keywords: IPA, Covid-19, Health Perceptions, Korean & Japanese Adolescents

1. Introduction

The coronavirus disease 2019 (COVID-19) outbreak in November 2019 and the consequent use of face masks and social distancing practices have significantly disrupted life as we know it. Social distancing practices and a contactless way of life have been some of the key consequences of this changing world. Many experts predict that there is no returning to the pre-COVID-19 life even after the virus is eradicated [1]. This contactless way of life is anticipated to persist even in the post-COVID-19 era.

Social distancing and the use of face masks have fundamentally changed people's daily lives [1]. Sedentary time increased, and physical activity reduced during the

COVID-19 pandemic [2,3]. Despite concerns about elevated sedentary time raised even before the pandemic, the issue has intensified during the pandemic. Further, such lifestyle changes have increased the percentage of those who are obese [4]. Moreover, countries struck by COVID-19 have reported several psychological problems, including depression and anxiety [3]. In other words, the pandemic has had mental repercussions, with life satisfaction and happiness index on the decline.

These problems are not confined to the adult population but rage across adolescents as well [5,6]. Schools—the place where Korean adolescents spend most of their day—are focused on anti-COVID-19 measures to halt the spread of the virus. Indoor exercise facilities that had been actively utilized by adolescents before the pandemic were closed. Other potential channels of spreading the virus and moving within schools and extracurricular sports activities (e.g. school sports clubs, afterschool sports, time fillers, Saturday sports day activity) were also controlled [7]. Additionally, adolescents engaged in less voluntary outdoor activities due to the fear of contracting COVID-19. With things that facilitated physical activities within and outside the school controlled during the pandemic, health problems are emerging among adolescents [8]. Nevertheless, the education authorities are sensitively reacting to the societal issues of academics and childcare. They are focusing on the measures to run curricular physical education (PE) classes amid the environmental changes provoked by the COVID-19 pandemic, such as online classes [9]. In other words, educational interests in the comprehensive issues of adolescent health and physical activity are minimal.

Situations are similar in Japan. In Japan, the percentage of schools that implemented temporary closure of specific grade levels and classes in response to the prevalent COVID-19 cases was still high at 13.8% as of February 9, 2022, and 8.5% as of March 9, 2022. Even amid such conditions, 31.5% of elementary schools provided safe home exercise guides [10]. More specifically, the percentages of schools providing exercise guidance are decreasing with advancing grade levels, at 36.0% among elementary schools, 25.1% among middle schools, and 21.1% among high schools [10]. However, reduced physical activities have been reported across a wide range of age groups [11]. Specifically, many concerns have been raised about the decline in children's physical fitness [10] polarization of exercise habits [12, 13], the decrease in physical activity and satisfaction with life of college students [11, 14], and the decrease in physical activity of the elderly [15]

Previous studies on adolescents' health during the COVID-19 pandemic examined adolescents' mental health, and most of these studies reported a deterioration of mental health among adolescents during the pandemic. More specifically, the COVID-19 pandemic elevated depression, anxiety, social isolation, maladaptation, stress, and deteriorated physical health among adolescents [5, 14-19]. Further, the prevalence of obesity has risen [20], and physical activities markedly declined among adolescents during the pandemic [21-23]. Many countries ordered the closure of indoor and outdoor sports facilities, such as swimming pools, playgrounds, and gyms. Such measures have limited adolescents' physical activities and induced their social isolation [24]. Moreover, adolescents' health-related quality of life (HRQoL) is reduced [25], and their lifestyles are changing [5,26,27]. Some attribute these to the closure of schools, the primary place of physical activity among adolescents, or restrictions of physical activities within schools even after reopening of schools [28]. In particular, Lee, So, and Youn [5] discovered in their importance-performance analysis (IPA) of health perceptions among Korean adolescents during the COVID-19 pandemic that disparities exist between therapeutic and preventive health factors. A follow-up study analyzed the differences in health perception according to the type of online PE classes upon transition from PE classes to online classes [6].

Nevertheless, the need to verify whether these study findings are unique to Korean adolescents or are universally evident across all adolescent populations has been highlighted. Therefore, first, we aim to conduct a follow-up study by comparing the study findings with that of Japanese adolescents as Japan features a similar school education

system. Further, there was a problem discovered in the studies by Lee, So, and Youn [5] and Yoo, Han, Youn, and Jung [6], where the results of IPA were mainly concentrated on a specific quadrant. Thus, we seek to develop a questionnaire that addresses this issue for use in our study. We have planned this study to seriously analyze the current health perceptions of students who are continuing their academic endeavors even during a global pandemic and present alternatives. From this perspective, our study will shed light on the importance of adolescents' health perceptions during the prolonged COVID-19 pandemic and discover alternative educational measures for actively addressing the health management problems affecting adolescents.

Therefore, the objective of this study is to conduct an empirical analysis by applying a modified IPA technique that divides Korean and Japanese adolescents' health perceptions during the COVID-19 pandemic into six domains: mental health management, disease management, physical activity management, sleep management, diet management, and hygiene management. The study presents data on the relationship between perceived importance and performance of health-related factors among Korean and Japanese adolescents, strategic priorities, and disparities in health perceptions between the two groups. These data will help evaluate school PE education during the COVID-19 pandemic and design future curricula. Moreover, the findings will serve as valuable foundational data for public and private educational institutions to plan and enforce health education in preparation for the post-COVID-19 era.

2. Materials and Methods

2.1. Participants

Table 1. Participants' demographic characteristics.

Characteristic	Category	Number (n)	Percentage (%)
Sex	Male	617	46.0
	Female	724	54.0
Nationality	Korea	676	50.4
	Japan	665	49.6
Total		1,341	100.0

The study population comprises Korean and Japanese adolescents who took a PE class during the 2021 pandemic. A total of 1,341 adolescents from two middle schoolers in Seoul, Korea (A, B), and two middle schools in Tokyo, Japan (C, D), were selected as participants using convenience sampling, a nonprobability sampling method, from September to October 2021. Further, an online questionnaire (Google forms) and offline questionnaire were administered. Table 1 shows the demographic characteristics of the participants.

2.2. Instruments

Instruments used in previous studies that were deemed to be appropriate for use in this study were employed here. Participants' demographics were set to sex and nationality, both of which were assessed as nominal variables. To measure health perception, the Health Perception Scale developed by Ware [29] and validated by Barakat et al. [30], Jones [31], Lee, So, and Youn [5], and Yoo, Han, Youn, and Jung [6] was modified for use in this study. In particular, we used an alternative IPA questionnaire to prevent the results primarily converging in a single quadrant, which is a shortcoming of IPA. The six subscales comprised mental health management, disease management, physical activity

management, sleep management, diet management, and hygiene management. Each item was rated on a five-point Likert scale comprising 1 strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. The scores for each subscale were calculated independently.

2.3. Reliability of Instruments

In this study, we used the Cronbach's α to test the internal consistency reliability of the items. The results are shown in Table 2. The Cronbach's α for all subscales of health perception ranged from 0.702–0.940, above the cut-off of 0.7. Thus, the scale has a high internal consistency [32].

Table 2. Reliability analysis.

Variable		Cronbach's α
Mental health management	Importance	.880
	Satisfaction	.876
Disease management	Importance	.796
	Satisfaction	.702
Physical activity management	Importance	.879
	Satisfaction	.840
Sleep management	Importance	.864
	Satisfaction	.793
Diet management	Importance	.851
	Satisfaction	.743
Hygiene management	Importance	.940
	Satisfaction	.884

2.4. Procedure and Data Analysis

We collected data through an online questionnaire (Google forms) and offline questionnaire on Korean and Japanese adolescents for the study purpose. The pilot test was conducted in June 2021 on 300 Korean adolescents and 300 Japanese adolescents. Further, the main questionnaire was conducted from September to October 2021 on 1,441 (742 Korean, 691 Japanese) students. After excluding eight questionnaires with missing responses and 92 questionnaires with careless responses, a total of 1,341 questionnaires were included in the analysis. The collected data were analyzed using the SPSS 18.0 software (IBM Corp., Armonk, NY, USA). First, participants' demographic characteristics were analyzed with frequency analysis. Second, the reliability of the instrument was assessed using Cronbach's α . Third, health perceptions in each country and the differences in importance and performance for each factor between the two groups were analyzed with paired samples t-test. Fourth, the differences in importance-importance and performance-performance between the two countries were analyzed with paired samples t-test. Finally, the perceived importance and performance of each variable were evaluated using IPA. The data collection analysis and text writing were translated into Korean, Japanese, and English for a cross-review by Korean and Japanese authors. The study was approved by the Institutional Review Board (IRB) at Wonkwang University in Korea (WKIRB-202009-SB-053) and the Nippon Science University (IRB) (NSSUIRB-021-H083).

3. Results

3.1. Differences in Importance-Performance between the Two Countries

First, a paired t-test was performed for importance-performance data from Korean adolescents, and there were statistically significant differences between importance-performance for all variables.

Table 3. differences in importance-performance regarding health perception among Korean adolescents.

Variable	Importance		Performance		Difference in Mean	t	p
	M	SD	M	SD			
Mental health management	4.57	0.51	4.02	0.73	0.02	23.176	.000***
Disease management	4.58	0.53	4.23	0.66	0.02	17.752	.000***
Physical activity management	4.23	0.74	3.52	1.02	0.03	22.635	.000***
Sleep management	4.46	0.63	3.58	0.95	0.03	26.850	.000***
Diet management	4.40	0.68	3.79	0.88	0.03	22.884	.000***
Hygiene management	4.69	0.46	4.42	0.54	0.01	20.381	.000***

*** $p < .001$, tested by Paired Sample t-test.

Second, a paired samples t-test was performed for importance-performance data from Japanese adolescents, and there were statistically significant differences between importance-performance for all variables.

Table 4. Differences in importance-performance regarding health perception among Japanese adolescents.

Variable	Importance		Performance		Difference in Mean	t	p
	M	SD	M	S			
Mental health management	4.30	0.75	3.92	0.85	0.02	18.566	.000***
Disease management	4.37	0.74	4.17	0.78	0.02	11.606	.000***
Physical activity management	4.06	0.88	3.36	1.09	0.04	19.422	.000***
Sleep management	4.31	0.81	3.59	0.95	0.03	23.039	.000***
Diet management	4.28	0.85	3.90	0.89	0.02	16.503	.000***
Hygiene management	4.47	0.72	4.24	0.71	0.01	16.683	.000***

*** $p < .001$, tested by Paired Sample t-test.

3.2. Differences in Importance and Performance between the Two Countries

First, a paired samples t-test was performed to examine the differences in the perceived importance between Korean and Japanese adolescents, and there were statistically significant differences in the perceived importance between the two countries for all variables.

Table 5. Differences in perceived importance of health perception between Korean and Japanese adolescents.

Variable	Korea		Japan		t	p
	M	SD	M	SD		
Mental health management	4.57	0.51	4.30	0.75	7.550	.000***
Disease management	4.58	0.53	4.37	0.74	5.992	.000***
Physical activity management	4.23	0.74	4.06	0.88	4.045	.000***
Sleep management	4.46	0.63	4.31	0.81	3.934	.000***
Diet management	4.40	0.68	4.28	0.85	2.973	.003**
Hygiene management	4.69	0.46	4.47	0.72	6.484	.000***

*** $p < .001$, ** $p < .005$ tested by Paired Sample t-test.

Second, a paired samples t-test was performed to examine the differences in the performance between Korean and Japanese adolescents. There were statistically significant differences in the health perception between the two countries for mental health, disease management, physical activity, and hygiene management but not for sleep management and diet management.

Table 6. Differences in performance of health perception between Korean and Japanese adolescents.

Variable	Korea		Japan		t	p
	M	SD	M	SD		
Mental health management	4.02	0.73	3.92	0.85	3.032	.002**
Disease management	4.23	0.66	4.17	0.78	3.375	.001**
Physical activity management	3.52	1.02	3.36	1.09	3.370	.001**
Sleep management	3.58	0.95	3.59	0.95	.763	.446
Diet management	3.79	0.88	3.90	0.89	-1.283	.200
Hygiene management	4.42	0.54	4.24	0.71	5.339	.000***

*** $p < .001$, ** $p < .005$ tested by Paired Sample t-test.

3.3. Differences in the IPA Matrix between the Two Countries

First, the IPA matrix for Korean adolescents was generated with the mean importance score of 4.49 and mean performance score of 3.93 as the reference values. Next, the IPA matrix for Japanese adolescents was generated with the mean importance score of 4.30 and mean performance score of 3.86 as the reference values. The results are displayed in Table 8 and Figure 1.

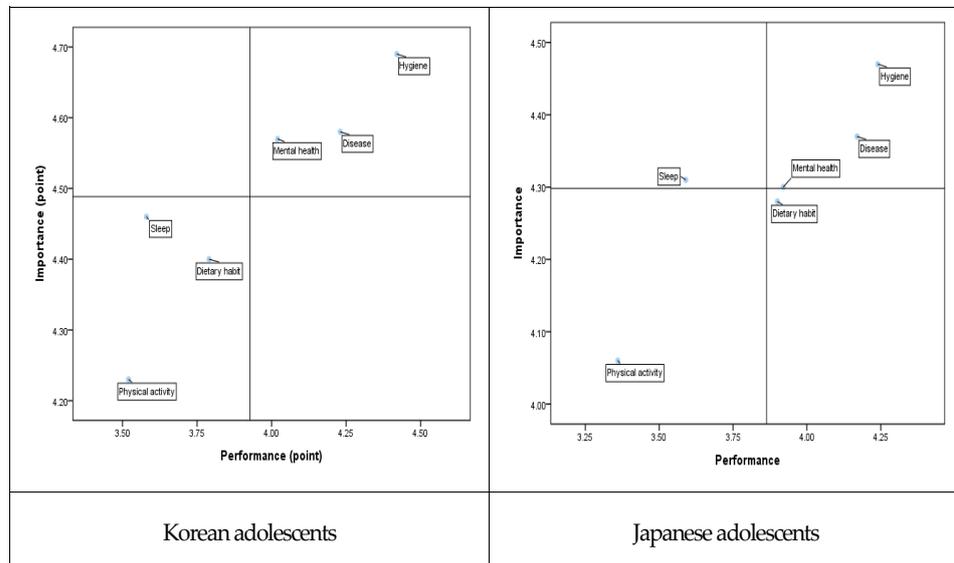


Figure 1. IPA Matrix – Factors.

Table 7. Health perception factor distribution in Korean and Japanese adolescents.

Category	Criteria	School	Factor distribution
Quadrant I (Concentrate here)	Importance↑, Performance↑	Korea	Hygiene management, disease management, mental health management
		Japan	Hygiene management, disease management, mental health management
Quadrant II (Keep up the good work)	Importance↑, Performance↓	Korea	None
		Japan	Sleep management
Quadrant III (Low priority)	Importance↓, Performance↓	Korea	Physical activity management, sleep management, diet management
		Japan	Physical activity management
Quadrant IV (Possible over-kill)	Importance↓, Performance↑	Korea	None
		Japan	Diet

First, hygiene management, disease management, and mental health management were placed in quadrant I—indicating high importance and performance—among Korean and Japanese adolescents. Second, none of the variables were placed in quadrant II among Korean adolescents. However, sleep management was placed in this quadrant among Japanese adolescents, indicating high importance and low performance in sleep

management. Third, physical activity management, sleep management, and diet management were in quadrant III—indicating low importance and performance—among Korean adolescents. Among Japanese adolescents, only physical activity management was linked to low importance and performance. Fourth, none of the variables were placed in quadrant IV among Korean adolescents. Nevertheless, diet management was placed in this quadrant among Japanese adolescents indicating low importance and high performance in diet management.

4. Discussion

This study analyzed the perceived importance and performance of health-related factors during the COVID-19 pandemic among adolescents in Korea and Japan using the IPA. It discussed the major findings in light of previously published findings.

First, adolescents in both countries perceived various health-related factors as important during the COVID-19 pandemic but demonstrated relatively low performance of these factors. In Korea, the gap between importance and performance was the largest for “sleep management,” followed by “mental health,” “diet management,” “physical activity,” “hygiene management,” and “disease management.” In Japan, the gap was the largest for “sleep management,” followed by “physical activity,” “mental health,” “hygiene management,” “diet management,” and “disease management.” The gap between importance and performance was the largest for sleep management and smallest for disease management in both countries, while the ranking of other factors varied.

These results suggest that adolescents in these two countries are aware of the importance of sleep management but have difficulty managing their sleep [5, 39] due to increased use of digital media stemming from extended online learning as a result of the COVID-19 pandemic. This is in line with results reported by previous studies that adolescents show increased usage of digital media [35-37] and that the use of media affects sleep [38]. Similarly, a study conducted in Austria reported that adolescents' smartphone usage surged while physical activity declined due to COVID-19 [40]. However, adolescents from both countries perceived disease management to be important. Their performance in disease management also increased, presumably owing to continued anti-infection measures by the national and local governments in both countries—apart from the rising number of confirmed cases—and continuous education at school [5, 41].

Second, Korean adolescents perceived all health-related factors as more important than did their Japanese counterparts. More specifically, the perceived importance between the two populations markedly differed for “mental health,” “hygiene management,” “disease management,” “physical activity,” and “sleep management.”

Such differences are evident in the level of health and health-promoting policies in the two countries. Japan boasts the best health and health achievement globally, while Korea does not make the top 30 countries for these indices [42]. In this background, it can be said that Japan has achieved a high level of health where individuals manage their own health, facilitated by the implementation of national health-promotion policies since the 1970s. Furthermore, the fact that Japanese schools impart knowledge about disease prevention, including infections, through PE and health education classes from elementary school to high school is another key reason underlying this achievement [43-45]. In Korea, national health-promotion policies were implemented in the 2000s and are being actively enforced [46]. Therefore, Korean adolescents feel more exposed to Korean versions of health-promotion projects led by the national and local governments and schools and seem to perceive health as important. Conversely, as evident by the fact that a mandatory lockdown was never enforced in Japan during the COVID-19 pandemic despite ordering school closures, Japan currently promotes individuals to manage their own health. Hence, Japanese adolescents would be less exposed to health-promoting policies, which could have contributed to the relatively lower perceived importance of health compared to their Korean counterparts.

Korean adolescents showed higher performance in four health domains than Japanese adolescents, while performance did not differ in two domains between the two populations. Performance in “hygiene management” markedly differed between the two populations, and that in “disease management” and “physical activity” also significantly differed between the two populations.

National and local government-led anti-COVID-19 measures—the K-anti-infection system—including school closure and conversion to online courses, have seemingly enhanced Korean adolescents’ performance in hygiene management and disease management [47]. Although this may be minor, in Japan, the Ministry of Education, Culture, Sports, Science and Technology actively published reference materials to deal with the prevalent infection, and adolescents actively engaged in hygiene management or disease management independently [48,49]. Regarding physical activity, Japan had been providing many PE and club activities at schools before the COVID-19 pandemic, through which students had engaged in an adequate amount and duration of physical activity [43,50]. In Korea, schools have implemented several sports activities through PE, school sports clubs, school sports leagues, afterschool activities, and Saturday sports since 2010 [51,52]. The COVID-19 pandemic hit the two countries at crucial times, and schools have implemented distancing and no physical contact policies and limited PE classes in response to the pandemic. Japanese adolescents have been seemingly more heavily influenced by such measures in terms of their physical activities.

Third, there were similarities and differences in the distribution of four quadrants in the IPA matrix for health perception between Korean and Japanese adolescents. Quadrant I (keep up the good work) indicates high importance and performance, and “hygiene management,” “disease management,” and “mental health” were placed in this quadrant for both populations. The importance and performance of “hygiene management” and “disease management” seem to be products of the Korean and Japanese governments’ anti-infection measures and anti-infection education provided by schools. Such public organization-led anti-infection measures instilled the importance of routine hygiene and disease management in adolescents of both countries. Our result suggests that adolescents are translating this to actual practice. Regarding mental health, many studies mention COVID-19 blues, depression, and helplessness among adolescents [53-55]. Further, people have been found to feel lonely and experience depression and anxiety because of social isolation [56]. In particular, this study identified mental health problems not previously examined as a result of the special educational and college admission systems in Korea and Japan. Prior to the COVID-19 pandemic, adolescents in Korea and Japan had been suffering from intense academic stress from the fierce competition in gaining admission to eminent college [57]. Consequently, the suicide rate is high among adolescents in both countries [58]. However, the rates of stress, suicidal ideation, suicidal planning, and suicide attempt have declined since the outbreak of COVID-19 compared to the pre-COVID-19 levels [8]. Such adverse mental health factors affecting adolescents seem to have diminished partly owing to social distancing and the use of off-line and online classes during the COVID-19 pandemic. These results show that amid the prolonging of the pandemic, adolescents from both countries show promising progresses in “hygiene management,” “disease management,” and “mental health.” Thus, it is necessary to accept the current situation positively and maintain and improve the status quo. This will require educational programs that involve appropriate interactions with experts and parents [8].

Quadrant II (concentrate here) indicates high importance but low performance, and factors in this quadrant call for urgent improvement. None of the health-related factors belonged in this quadrant among Korean adolescents. However, “sleep management” was placed in this quadrant among Japanese adolescents. Japanese adolescents have been reported to sleep longer during the COVID-19 pandemic [59]; therefore, it seems that the quality (e.g., regularity, deep sleep) of their sleep is poor [36]. Hence, actively promoting sleep management, including sleep quality, is as essential as imparting the importance of sleep among adolescents amid the extension of the pandemic.

Quadrant III (low priority) indicates low importance and performance and thus does not require more effort for improvement beyond the current level. Among Korean adolescents, three factors (“physical activity,” “sleep management,” and “diet”) had low importance and performance. Among Japanese adolescents, only “physical activity” was placed in this quadrant.

The problems of diet and sleep among Korean adolescents are attributable to the irregularity of in-person school days and online classes during the COVID-19 pandemic. Students can enjoy regular, nutritionally balanced meals when physically going to school; however, they have difficulty consuming meals regularly or enjoying nutritionally balanced meals during online learning. They often skip breakfast or skip lunch or eat food hurriedly due to the short lunchtime [60,61]. Moreover, students also enjoy late-night snacks, and even when they physically attend school, they eat quickly or inadequately to prevent contracting COVID-19. Most importantly, the increased rate of junk food consumption is a critical cause of diet-induced health problems. Adolescents’ consumption of junk foods, such as carbonated drinks, fast food, and ramen, leads to poorly balanced diets in terms of vegetables, fruits, milk, and breakfast intake. It indirectly and directly impairs health, causing stress, depression, and poor self-rated health [62]. Our result that adolescents showed low perceived importance and performance regarding diet management could be due to the COVID-19 pandemic hindering the formation of values for diet [63].

Regarding sleep management, frequent online classes and exposure to digital media and a smartphone-centered lifestyle caused by restrictions in activities of daily living and physical activities seem to affect their sleep adversely [5, 39]. These results are in line with pre-COVID-19 reports that adolescents neglect their health [64]. Moreover, it suggests that while adolescents perceive preventing and treating COVID-19 since the pandemic outbreak, they relatively lack interest in and practice routine behaviors for maintaining and promoting their health, including sleep and diet management. In this context, education about diet, sleep management, and physical activity should be coupled with interventions that promote their practice of these activities. These could prove useful or Korean adolescents amid the prolonged pandemic.

Notably, adolescents in both countries showed the lowest importance and performance in physical activity. Many scholars worldwide have warned that students are exposed to risks such as obesity, diabetes mellitus, and hypertension because of the extended suspension of in-person education and outdoor activities during the COVID-19 pandemic [65,66]. Physical activity-focused PE classes that have been offered in schools in Korea and Japan have been replaced by hybrid (online + offline) PE classes as a result of the pandemic. Further, club programs involving physical activity and school sports club activities have been restricted [9,67]. Additionally, inadequate engagement in various extracurricular and leisure activities could have contributed to the low perceived importance and practice of physical activity. Reportedly, adolescents gained bodyweight faster during school breaks than during school semesters, even before the COVID-19 pandemic [63]. While school classes are conducted in a hybrid format currently, the current situation is like an extension of the summer break for students in terms of the amount of physical activity. Prior to the pandemic, students could engage in considerable physical activity through their daily activities while commuting to and from school and by participating in various activities, including PE classes [37, 68].

Physical activity is a key element of a healthy lifestyle, and it features evidence-based effects on improving physical health (e.g., obesity, physical fitness), mental health (e.g., anxiety, depression, happiness), social life, and lifestyle [69,70]. Further, physical activity contributes to individuals’ health during adolescence and throughout their entire lives [71]. Most importantly, sedentary lifestyle undermines human lives, as evident by it being the fourth leading cause of death. However, physical activity contributes to mental well-being even during the COVID-19 pandemic [3], and it is a non-invasive and cost-effective means to protect one’s body from viruses by boosting their immune system [72]. Nevertheless, physical activity programs should be designed

systematically to involve moderate- to vigorous-intensity exercise instead of simply lengthening the duration of physical activity. A longitudinal study conducted on Japanese adolescents found a significant association between participation in a sport club in adolescence and reduced mortality risk from cardiovascular disease in adulthood [73]. In Korea, physical activity programs [54] and music-incorporated physical activity programs have been developed for adolescents to promote their health [74]. Several other countries currently run school-based moderate- to vigorous-intensity physical activity programs for adolescents. Some prime examples are "TAKE 10!" in the United States, the Schools on the Move in Finland, and Smart Moves in Australia [68]. Several European countries, such as France, Germany, and Ireland, also provide students opportunities to participate in diverse moderate- to vigorous-intensity physical activity programs through school PE classes and afterschool programs [75].

As shown here, it is important to expand the opportunities for students to participate in systematic moderate- to vigorous-intensity physical activity to promote ideal physical growth and immunity in adolescents in Korea and Japan. In particular, amid the prolonging of the COVID-19 pandemic, it is essential to strive to design and implement programs that comprise educational aspects and practice-promoting aspects, considering all health-related factors overall. This is in opposition to comparing the ranks or levels of "diet," "sleep management," and "physical activity" between Korean and Japanese adolescent populations.

Quadrant IV (possible overkill) indicates low importance but high performance, where the factors in this quadrant are perceived to be less important than others but are practiced more than necessary. Although none of the health-related factors were present in this quadrant among Korean adolescents, "diet" was placed in this quadrant among Japanese adolescents. It is highly likely that Japanese adolescents do not perceive diet to be as important as other health-related factors because the Japanese culture features enjoying small portions of food [43, 76]. Furthermore, as Japan has a well-developed school meal system, adolescents naturally demonstrate high performance in diet management [76, 77]. In other words, Japanese people have extremely positive values towards diet culture. Therefore, it is important to educate Japanese adolescents about the importance of diet and the values of the good eating culture of their country. This will help adolescents practice their current eating culture more effectively and foster a healthier eating culture.

5. Conclusions

Based on our findings, it is important for national government, public education institutions, and families to couple a therapeutic approach with a preventive and management approach that encourages periodic exercise, desirable diet, and adequate sleep when exploring measures to maintain and promote adolescents' health. First, the national government, local governments, and schools continue to promote and educate adolescents in hygiene management, disease management, and mental health management from a therapeutic perspective to maintain the status quo. Conversely, special efforts are required on the part of schools and families in terms of diet, sleep, and physical activity management from a preventive perspective for adolescents in both countries.

In particular, physical activity was identified as the most vulnerable health-related factor in Korean and Japanese adolescents, calling for the development of various remote PE programs and efforts to facilitate PE activities during in-person sessions. In other words, the school curricula must be modified to promote physical activity by promoting in-person PE classes, school sports clubs, afterschool sports activities, school sports club leagues, and Saturday sports. To this end, the Office of Education, schools, relevant organizations, teachers, and parents must engage in necessary efforts to improve the curricula.

Subsequent studies should expand the sample to more countries, regions, and age groups and comparatively analyze results with ours. Further, in-depth interviews, observations, and document analyses are needed for students and teachers to enable a

broader and deeper interpretation of IPA results. Moreover, a mixed-methods methodology should be utilized to present more dynamic and persuasive study findings and implications.

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