 doi:10.20944/preprints202105.0736.v1

Article

Comparison of Health Awareness in South Korean Middle School Students According to Type of Online Physical Education Classes During the COVID-19 Pandemic

Jung-In Yoo [1,†], Joung-Kyue Han [2,†], Hyun-Su Youn [3,*,‡], Joo-Hyug Jung [4,*,‡]

[1] Department of Physical Education, Korea University, Seoul-si, 02841 South Korea; surfyji@korea.ac.kr
[2] Department of College of Sport Science, Chung-Ang University, Anseong-si, 17546 South Korea; jkhan@cau.ac.kr
[3] Department of Physical Education, WonKwang University, Iksan-si 54538, South Korea; younhyunsu9518@wku.ac.kr
[4] Department of Physical Education, Korea University, Seoul-si, 02841 South Korea; pedagogy@korea.ac.kr

†The first two authors (Jung-In Yoo and Joung-Kyue Han) contributed equally to this work
‡ The corresponding two authors (Hyun-Su Youn and, Joo-Hyug Jung) contributed equally to this work.

* Correspondence: younhyunsu9518@wku.ac.kr (H.-S.Y.); pedagogy@korea.ac.kr (J.-H.J.); Tel.: 82-63-850-6623 (H.-S.Y.); 82-2-3290-2314 (J.-H.J.); Fax: +82-63-850-6666 (H.-S.Y.); 82-31-631-6477 (J.-H.J.)

Abstract: This study aimed to assess the differences in the importance and performance of health awareness in Korean middle school students according to the types of online physical education classes they attended during the coronavirus disease-2019 pandemic. Overall, 583 participants were selected using a convenience sampling method; the data were obtained through an online survey using Google forms. Frequency analysis, reliability analysis, independent sample t-test, and importance-performance analysis were performed. First, the differences between importance and performance were found to be the most for sleep and physical activity management, and the least for disease and hygiene management. In addition, both the groups demonstrated higher importance and performance for hygiene and disease management. There were significant differences in the importance and performance of all the sub-factors. Second, hygiene, disease management, and mental health management were found in quadrant I in both the groups, while physical activity, sleep, and dietary habit management were in quadrant III. No factors were in quadrant II and IV.

Keywords: middle school students, health perception, importance-performance analysis (IPA), online physical education class types, COVID-19

1. Introduction

The coronavirus disease-2019 (COVID-19) is a respiratory infection that has caused a global pandemic. Consequently, the World Health Organization (WHO) declared it an "international public health emergency" in 2020, making it the third pandemic following the Hong Kong (1968) and swine flus (2009) [1]. Its global spread has significantly changed everyone's lives in various cultural, economic, and societal aspects. Among many alterations, a new trend, "untact," has emerged following COVID-19 measures, including social distancing and working from home, in order to prevent the spread of the infection.

The "untact" culture of performing everyday tasks in non-face-to-face online settings has been accelerated by the pandemic. In particular, the "ontact" era, which refers to online connections to the outside world in "untact" settings, has encouraged virtual sports, concerts, and lectures as well as innovative developments such as video conferences, online financing, and online medical appointments. Such changes have also affected academia. In Korea, after postponing commencement in 2020, schools officially began virtually in April ; moreover, the increase in the number of non-face-to-face learners has become a representative example of "ontact."

 doi:10.20944/preprints202105.0736.v1

Online classes require extensive preparation by schools. New tasks for remote virtual lectures have been assigned to teachers, and novel measures have been established for practical online teaching and learning, from creating online platforms to implementing remote lectures. Teachers have agreed that online classes are a means to prevent educational deficits, and have actively prepared for remote online lectures, although the learning effects may not be the same.

The same measures have been applied for physical education (PE) classes; however, since their focus is on physical activities, the challenges experienced are different to other subjects. Teachers who teach online have expressed difficulties in implementing virtual lectures, where the value of PE is unverified. They have experienced complications in designing curriculum plans and teaching-learning environments. In addition, applying the teaching methods, interacting with students, evaluating their performance, preparing classes, and conducting them every week has also been found to be problematic [2].

Recently, PE classes have been slowly stabilizing after the initial chaos caused due to COVID-19. Some PE teachers have devised interactive classes through real-time video instructions and distance education platforms to effectively communicate with their students. Furthermore, others have designed lectures that use recorded content to offer theoretical and practical learning. Additionally, task-oriented PE classes have also been implemented to evaluate student achievement. Such lectures involve assignments related to PE achievement standards; students are instructed to complete and upload their work, and teachers provide them with specific feedback through online chat rooms [3].

Although educators have considered alternatives that most effectively deliver the necessary contents, their students may doubt the learning effects of these online PE classes. During the COVID-19 pandemic, health problems such as corona blues, helplessness, and depression caused due to social distancing, a contact-less culture, working from home, and quarantine have been observed in adults [4-6]. Furthermore, limited leisure, clubs, and sports activities have threatened the physical health of the general population [7-9]. It has been postulated that middle school students, who are physically more active than adults, are suffering as well in the limited environment of online classes [10-12].

One of the most important objectives of PE is "healthy development and encouragement of healthy lifestyles in students." Good health is not only necessary for survival, but is also a prerequisite for happiness. In general, healthy individuals have a normal physical function, are aware of the body feeling rewarded and energetic, maintain a normal appetite and stable weight, sleep sufficiently, experience mental and physical stability, and find harmony in daily life; moreover, they have no diseases [13]. Therefore, the assessment of health awareness among middle school students attending online PE classes for over a year may be an index to gauge the effects of online PE classes on their learning during the COVID-19 pandemic. Additionally, these health indicators may provide important data that could indirectly evaluate happiness in middle school students. Health awareness is a subjective process of being conscious of external stimuli related to wellbeing through sensory organs [14, 15]. Specifically, it is a relative concept that is perceived differently by each individual depending on their thoughts and interpretations of themselves [16].

Previous studies have analyzed the importance and performance of health, an important variable in our study. Izadi et al., Lopes and Maia, and Miranda et al. [17-19] assessed the significance and performance of health services, while Rau et al. [20] examined the importance of recording personal health. Furthermore, Lee et al. [21] investigated health awareness in adolescents. Essentially, importance-performance analysis (IPA) studies on health have mainly been conducted on patients and have been limited to specific subjects and situations. Additionally, they have not been carried out during special circumstances such as the COVID-19 pandemic; thus, there is a lack of research on middle school students participating in online PE classes.

It is crucial to provide appropriate health education during adolescence, which is a period of rapid growth. Thus, it would be necessary to understand the importance and

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 31 May 2021 doi:10.20944/preprints202105.0736.v1

performance of health awareness in middle school students during the unforeseen COVID-19 pandemic. Therefore, this research attempted to fill the gap in the literature, considering the limitations of previous studies, and the significance of health awareness during adolescence.

This study divided middle school students into those who participated in interactive online PE classes and those who attended assignment-based PE classes. Their health awareness was analyzed and divided into the following sub-factors: the management of mental health, disease, physical activity, sleep, dietary habits, and hygiene. Moreover, an IPA was conducted for empirical analysis as the relationships among the importance and performance of health in middle school students, strategic priorities, and their differences in health awareness would be useful for evaluating online PE classes and designing future curricula. Additionally, the findings of this study will serve as important basic data for future planning and implementation of health education in public and private educational institutions.

2. Materials and Methods

2.1. Participants

After obtaining approval from the Institutional Review Board (IRB) of the Wonkwang University (WKIRB-202009-SB-053), convenience sampling, a non-probability sampling method, was employed. Overall, 583 students were selected from the K and C middle schools who participated in the assignment-based and interactive online PE classes, respectively, during the COVID-19 pandemic. They were requested to complete a Google form questionnaire. Their demographic characteristics are presented in Table 1.

Table 1. Demographics of the study participants

Characteristics	Classification	Frequency	%
Sex	Men	272	46.7
	Women	311	53.3
Class Type	Assignment-based online class (K middle school)	334	57.3
	Interactive online class (C middle school)	249	42.7
Total		583	100

2.2. Instruments

This study employed a nominal scale that comprised two items assessing the participants' general characteristics and the type of online class attended. The tool "Health Perception Scale," developed by Ware [16] was utilized in this study; its validity and reliability were verified by Lee, So, and Youn; Barakat et al.; Jones; and Lee et al. [21-24]. It was modified according to the purpose of the current study to examine health awareness. This measure consists of the following six factors: mental health, disease, physical activity, sleep, dietary habits, and hygiene management. Each of these items was evaluated individually on a five-point Likert scale ranging from "strongly agree" (5 points) to "strongly disagree" (1 point).

2.3. Reliability of instruments

Cronbach's alpha coefficient was calculated to verify the reliability and internal consistency of the scale used in the study; the results are shown in Table 2. The sub-domains of health awareness demonstrated coefficients that were higher than 0.70,

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 31 May 2021 doi:10.20944/preprints202105.0736.v1

ranging from 0.705 to 0.93, suggesting high inter-item consistency [25]. Additionally, the scale's reliability increased after excluding the sub-factors having higher "alpha if item deleted" than "Cronbach's alpha." The research was conducted after deleting one question (sleep management, #4).

Table 2. Results of the reliability analysis

Factors		Cronbach's α
Mental health management	Importance	.895
	Performance	.915
Disease management	Importance	.807
	Performance	.705
Physical activity management	Importance	.877
	Performance	.842
Sleep management	Importance	.806
	Performance	.769
Dietary habit management	Importance	.843
	Performance	.712
Hygiene management	Importance	.931
	Performance	.843

2.4. Procedure and data analysis

The data were collected using a Google form questionnaire and analyzed using the SPSS software (version 18.0; IBM Corp., Armonk, NY, USA). The detailed analysis method was as follows: First, a frequency analysis was conducted to confirm the demographics of the participants. Second, Cronbach's α was calculated to verify the tool's reliability. Third, a paired sample t-test was carried out to assess health awareness and the differences between the importance and performance of each factor. Subsequently, an independent samples t-test was performed to examine the importance and performance of the factors between the two groups. Finally, an IPA was conducted to validate the importance and performance of each factor; a p value less than 0.001 was considered significant.

3. Results

3.1. Differences in the importance-performance of health awareness according to the types of online PE classes

Tables 3 and 4 show the results of the paired sample t-tests, indicating significant differences between the importance and performance of all health awareness factors of the students who participated in the assignment-based and interactive online PE classes. Further, the independent sample t-test revealed no significant differences in any of the factors of health awareness between the two groups of students.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 31 May 2021 doi:10.20944/preprints202105.0736.v1

Table 3. Differences in the importance-performance of health awareness in K middle school students participating in the assignment-based online PE classes

Factors	Importance		Performance		Difference in mean	Rank	t	*p*
	M	SD	M	SD				
Mental health management	4.62	0.49	4.11	0.73	0.51	4	15.214	.000***
Disease management	4.67	0.51	4.40	0.65	0.27	5	9.359	.000***
Physical activity management	4.30	0.68	3.62	0.95	0.68	2	15.555	.000***
Sleep management	4.53	0.60	3.58	0.97	0.95	1	19.478	.000***
Dietary habit management	4.42	0.67	3.89	0.82	0.53	3	13.742	.000***
Hygiene management	4.76	0.43	4.51	0.47	0.25	6	15.112	.000***

***$p < 0.001$, tested by paired sample *t*-test.

Table 4. Differences in the importance-performance of health awareness in the C middle school students participating in the interactive PE classes

Factors	Importance		Performance		Difference in mean	Rank	t	*p*
	M	SD	M	SD				
Mental health management	4.67	0.52	4.01	0.81	0.66	3	14.504	.000***
Disease management	4.67	0.54	4.29	0.70	0.38	5	11.570	.000***
Physical activity management	4.41	0.71	3.57	0.99	0.84	2	14.210	.000***
Sleep management	4.58	0.62	3.43	1.00	1.15	1	18.561	.000***
Dietary habit management	4.50	0.67	3.87	0.80	0.63	4	14.523	.000***
Hygiene management	4.80	0.48	4.60	0.51	0.20	6	12.399	.000***

***$p < 0.001$, tested by paired sample *t*-test.

3.2. Analysis of differences in importance-performance matrix

To plot the IPA matrix, the students who participated in the assignment-based and interactive online PE classes were divided using the mean importance values of 4.55 and 4.61, respectively, and the mean performance values of 4.02 and 3.96, respectively. The results are shown in Figures 1 and 2 and Table 5.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 31 May 2021 doi:10.20944/preprints202105.0736.v1

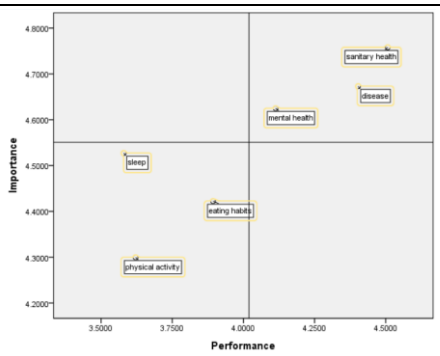

Figure 1. K middle school with assignment-based online PE classes

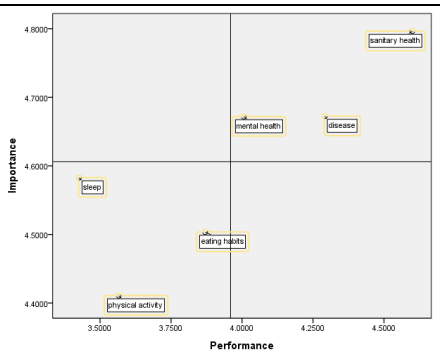

Figure 2. C middle school with interactive online PE classes

First, quadrant I (keep up the good work) indicated high importance and performance. Specifically, the students of both K and C middle schools had high performance in hygiene, disease, and mental health management. Second, quadrant II (concentrate here) revealed high importance and low performance, suggesting that urgent improvement was needed. No factor was found in quadrant II for both the groups. Third, quadrant III (low priority) demonstrated low importance and performance, signifying the requirement for extensive efforts. Specifically, for both the groups, the importance and performance levels were low physical activity, sleep, and dietary habit management. Fourth, quadrant IV (possible overkill) indicated low importance and high performance, suggesting that excessive effort was expended. In both groups, none of the factors belonged to this quadrant. Although there were slight differences in the location of the factors on the IPA matrix, the same results were observed in all four quadrants between the two groups of students.

Table 5. Distribution of health awareness factors in the K and C middle school students

Classification	Standard	School name	Factors
Quadrant I (keep up the good work)	importance↑, performance↑	K middle school	Hygiene, disease, and mental health management
		C middle school	Hygiene, disease, and mental health management
Quadrant II (concentrate here)	importance↑, performance↓	K middle school	None
		C middle school	None
Quadrant III (low priority)	importance↓, performance↓	K middle school	Physical activity, sleep, and dietary habit management
		C middle school	Physical activity, sleep, and dietary habit management
Quadrant IV (possible overkill)	importance↓, performance↑	K middle school	None
		C middle school	None

 doi:10.20944/preprints202105.0736.v1

4. Discussion

This study aimed to assess the importance and performance of health awareness among middle school students and evaluate the differences in health awareness between the students who participated in the assignment-based and interactive online PE classes.

First, the difference between the importance and performance of health awareness was the greatest for sleep and physical activity management, and the lowest for disease and hygiene management. In addition, both the groups demonstrated higher importance and performance for hygiene and disease management. There were significant differences in the importance and performance of all the sub-factors. These results were obtained because of the successful K-quarantine implemented by the Korean government and continuous education in schools. The increase in quarantine policy and education by the government highlighted the significance of hygiene awareness, leading to personal hygiene practices among middle school students. In contrast, physical activity, sleep, and dietary habit management had low importance and performance in both the groups. Our findings are similar to those of Henchoz, Cavalli, and Girardin [26], who reported that adolescents neglect their health practice behaviors despite physical activity, sleep, and dietary habits being essential factors for the maintenance and promotion of health. The outcomes of the current study indicated the students' awareness of the importance of preventing and treating the infection as well as their relatively low interest in the management of other health factors, excluding hygiene, disease, and mental health. Following the COVID-19 pandemic, social distancing, and restricted face-to-face classes significantly decreased their physical activity, and excessive exposure to digital media for studying and attending online classes may have caused difficulties in managing sleep and maintaining appropriate dietary habits.

Furthermore, the current education policy in Korea focuses on college entrance exams that already negatively affect the sleep and physical activity of adolescents; moreover, the COVID-19 pandemic may have further aggravated these factors. Therefore, effort is primarily required for factors with significant differences between their importance and performance in order to lessen this gap. The happiness of Korean adolescents has previously been one of the lowest among the OECD (Organization for Economic Cooperation and Development) countries; additionally, corona blues, depression, and isolation during the COVID-19 pandemic may have worsened their mental health.

Most importantly, physical activity had the lowest importance and performance in both the groups, suggesting that further efforts are required for its improvement. Globally, doctors have warned that the COVID-19 pandemic may lead to an increased risk of obesity due to limited outdoor activities and face-to-face interactions in school. Although non-face-to-face classes have been conducted for students, the level of activity is similar to that during vacations. Prior to the pandemic, students participated in PE classes and various other activities for physical activity. Approximately 79% of students indicated positive responses to school activities according to the 2016 School Sports Activity Participation Satisfaction Survey by the Korean Institute for Curriculum Evaluation [27]. However, the current situation restricts access to public playgrounds and group sports that may have contributed to decreased awareness of physical activity.

Second, hygiene, disease, and mental health management was shown in quadrant I (keep up the good work) in both the student groups, while physical activity, sleep, and dietary habit management were in quadrant III (low priority). However, none of the factors were located in quadrant II (concentrate here) or IV (possible overkill), suggesting that there was no difference in health awareness between the two groups. In a previous study on the importance and performance of health awareness in adolescents, Lee, So, and Youn [21] demonstrated that hygiene and disease management were in quadrant I, while mental health, physical activity, sleep, and dietary habit management were in quadrants II and III, respectively. These findings support the results of the present study.

To overcome the COVID-19 pandemic, many PE teachers introduced home training and interactive curriculum content to encourage students' physical activity. However, as

 doi:10.20944/preprints202105.0736.v1

revealed in this study, interactive online PE classes have limitations in increasing the awareness of physical activity management in middle school students. This suggests that although educators may feel that the level of physical activity provided through interactive online classes is sufficient, its awareness in students may not be determined by merely the number of activities. Physical activities for middle school students may include those on the grounds or gyms and group activities with friends and partners. The lack of difference in the IPA between assignment-based and interactive online PE classes supports this possibility. Thus, the COVID-19 pandemic led to online PE classes as well as limited school sports clubs and after-school activities. Additionally, Saturday sports day and various extracurricular and leisure activities were restricted, resulting in decreased awareness and performance of physical activity.

As shown by Lee et al., Mostert and Kesselring, and Bae and Hyeon [24, 28, 29], who reported the relationship between physical activity participation and health awareness, it is necessary to encourage physical activity during pandemics in order to promote adequate physical development and immunity in middle school students [21]. Intrinsically, various PE researchers have developed and implemented indoor activities that can be performed at home as the pandemic is likely to last for long. However, as indicated in this study, other types of activities may also be necessary to promote health awareness, particularly physical activities, among middle school students. For example, both face-to-face and non-face-to-face classes have been conducted simultaneously in Korea during the COVID-19 pandemic. There may be differences in the number of school days attended; however, it is believed that the blended curriculum involving both types of classes will continue in the near future. Thus, in this process, it would be essential to improve the curriculum contents to select courses such as those that are knowledge-based and can be conducted online; moreover, other lectures that involve experiments and practice such as PE classes, must be provided through offline meetings. Overall, the school curriculum needs to be revised to reflect the characteristics of each subject and offer a combination of face-to-face and non-face-to-face sessions.

Finally, based on the limitations of the current study, suggestions for follow-up studies are as follows: First, the current study assessed differences in health awareness according to the types of online PE classes. However, future studies should verify these differences between the two types of online classes. Second, this research only included middle school students from South Korea. In future studies, participants of different ages from various countries and regions should be recruited. Lastly, this study employed IPA, which is a quantitative research method, to evaluate health awareness among middle school students. In future, both quantitative and qualitative methods will be necessary to examine health awareness in both teachers and students.

5. Conclusions

The purpose of this study was to analyze and compare the health awareness of middle school students by dividing them into two groups based on whether they participated in interactive or assignment-based online PE classes.

First, the difference between importance and performance of the two groups was the greatest for sleep and physical activity management, and the least for disease and hygiene management. In addition, both the groups showed higher importance and performance for hygiene and disease management. There were significant differences in the importance and performance of all sub-factors.

Second, hygiene, disease, and mental health management were shown in quadrant I in both the groups, while physical activity, sleep, and dietary habit management were in quadrant III. However, no factors were located in quadrants II and IV, suggesting that there was no difference in health awareness between those who participated in the interactive and the assignment-based online PE class. Therefore, in addition to the development of various interactive online PE programs, revised curricula and active efforts of teachers are required to promote physical activities such as face-to-face PE classes, school club events, and after-school sports activities.

 doi:10.20944/preprints202105.0736.v1

Author Contributions: Study design: J.-I.Y. and J.-K.H. Study conduct: J.-I.Y., J.-K.H., H.-S.Y. and J.-H.J. Data collection: J.-I.Y. and J.-K.H. Data analysis: J.-I.Y., J.-K.H., H.-S.Y. and J.-H.J. Data interpretation: J.-I.Y. and J.-K.H. Drafting the manuscript: J.-I.Y., J.-K.H., H.-S.Y. and J.-H.J. Revising the manuscript content: J.-I.Y., J.-K.H., H.-S.Y. and J.-H.J. All authors have read and agreed to the published version of the manuscript. Funding: This research received no external funding. Conflicts of Interest: The authors declare no conflict of interest.

References

1. World Health Organization. Coronavirus disease (COVID-19) advice for the public. World Health Organization. Corona virus disease. 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public. Accessed 3 Apr 2020.
2. Lee, E. J., Zea, S. J., Youn, H. S. Exploring the difficulties and strategies of practicing online classes experienced by high school veteran physical education teachers in the corona19 pandemic. *Journal of Learner-Centered Curriculum and Instruction* **2020**, *20*(14), 339-362.
3. Jeong, H. C., Youn, H. S. A study on cases and assignments of secondary school online physical education class in the corona19 pandemic. *Asian Journal of Physical Education of Sport Science*, **2020**, *8*(3), 159-175.
4. Cullen, W., Gulati, G., & Kelly, B. D. Mental health in the Covid-19 pandemic. *QJM: An International Journal of Medicine* **2020**, *113*(5), 311-312.
5. Mazza, C., Ricci, E., Biondi, S., Colasanti, M., Ferracuti, S., Napoli, C., & Roma, P. A nationwide survey of psychological distress among Italian people during the COVID-19 pandemic: immediate psychological responses and associated factors. *Int. J. Environ. Res. Public Health* **2020**, *17*(9), 3165.
6. Zhang, J., Lu, H., Zeng, H., Zhang, S., Du, Q., Jiang, T., & Du, B. The differential psychological distress of populations affected by the COVID-19 pandemic. *Brain Behav Immun* **2020**, *87*,49-50
7. Wilke, J., Mohr, L., Tenforde, A. S., Edouard, P., Fossati, C., González-Gross, M., ... & Hollander, K. (2021). A pandemic within the pandemic? Physical activity levels substantially decreased in countries affected by COVID-19. *Int. J. Environ. Res. Public Health* **2021**, *18*(5), 2235.
8. Woods, J., Hutchinson, N. T., Powers, S. K., Roberts, W. O., Gomez-Cabrera, M. C., Radak, Z., ... & Ji, L. L. The COVID-19 pandemic and physical activity. *Sports Medicine and Health Science* **2020**, *2*(2), 55-64
9. Dwyer, M. J., Pasini, M., De Dominicis, S., & Righi, E. Physical activity: Benefits and challenges during the COVID-19 pandemic. *Scand J Med Sci Sports* **2020**, *30*(7), 1291.
10. Guessoum, S. B., Lachal, J., Radjack, R., Carretier, E., Minassian, S., Benoit, L., & Moro, M. R. Adolescent psychiatric disorders during the COVID-19 pandemic and lockdown. *Psychiatry Res* **2020,** *291*, 113264.
11. Imran, N., Zeshan, M., & Pervaiz, Z. Mental health considerations for children & adolescents in COVID-19 pandemic. *Pak J Med Sci* **2020**, *36*(COVID19-S4), S67.
12. Fegert, J. M., Vitiello, B., Plener, P. L., & Clemens, V. Challenges and burden of the Coronavirus 2019 (COVID-19) pandemic for child and adolescent mental health: a narrative review to highlight clinical and research needs in the acute phase and the long return to normality. Child Adolesc. Psychiatry Ment. Health **2020**, *14*, 1-11.
13. Han, M. K. Public Health Science. Gyeonggi: Hyungseul Press. 2003
14. Condello, G., Capranica, L., Stager, J., Forte, R., Falbo, S., Di Baldassarre, A., ... & Pesce, C. Physical activity and health perception in aging: Do body mass and satisfaction matter? A three-path mediated link. *PLoS One* **2016**, *11*(9), e0160805.
15. Curi, V. S., Vilaça, J., Haas, A. N., & Fernandes, H. M. Effects of 16-weeks of Pilates on health perception and sleep quality among elderly women. *Arch Gerontol Geriatr* **2018**, *74*, 118-122.
16. Ware, J. E. Health perception questionnaire instruments for measuring nursing practice and other care variables. Hyattsville, Maryland: DHEW Publication, 1979, 158-161.
17. Izadi, A., Jahani, Y., Rafiei, S., Masoud, A., & Vali, L. (2017). Evaluating health service quality: using importance performance analysis. *Int J Health Care* Qual Assur **2017**, *30*(7), 656-663.
18. Lopes, S. D. F., & Maia, S. C. F. Applying importance-performance analysis to the management of health care services. *China-USA Business Review* **2012**, *11*(2).
19. Miranda, F. J., Chamorro, A., Murillo, L. R., & Vega, J. An importance-performance analysis of primary health care services: managers vs. patients perceptions. *Journal of Service Science and Management* **2010**, *3*(02), 227.
20. Rau, H. H., Wu, Y. S., Chu, C. M., Wang, F. C., Hsu, M. H., Chang, C. W., ... & Wen, H. C. Importance-performance analysis of personal health records in Taiwan: A web-based survey. *JMIR* **2017**, *19*(4), e131.
21. Lee, S. M., So, W. Y., & Youn, H. S. Importance-performance analysis of health perception among Korean adolescents during the COVID-19 pandemic. *Int. J. Environ. Res. Public Health* **2021**, *18*(3), 1280.
22. Barakat, R., Pelaez, M., Montejo, R., Luaces, M., & Zakynthinaki, M. Exercise during pregnancy improves maternal health perception: a randomized controlled trial. *Am. J. Obstet. Gynecol* **2011**, *204*(5), 402-e1.
23. Jones, A. L. The influence of shape and colour cue classes on facial health perception. *Evol Hum Behav* **2018**, *39*(1), 19-29.
24. Lee, S. M., Jeong, H. C., So, W. Y., & Youn, H. S. Mediating effect of sports participation on the relationship between health perceptions and health promoting behavior in adolescents. *Int. J. Environ. Res. Public Health* **2021,** *17*(18), 6744.
25. Weaver, B., & Maxwell, H. Exploratory factor analysis and reliability analysis with missing data: A simple method for SPSS users. *The Quantitative Methods for Psychology* **2014**, *10*(2), 143-152.
26. Henchoz, K., Cavalli, S., & Girardin, M. Health perception and health status in advanced old age: A paradox of association. *Journal of Aging Studies* **2008**, *22*(3), 282-290.
27. Ministry of Education. Plans to Promote School Sports in 2016. **2016**
28. Mostert, S., & Kesselring, J. Effects of a short-term exercise training program on aerobic fitness, fatigue, health perception and activity level of subjects with multiple sclerosis. *Mult Scler J* **2002**, *8*(2), 161-168.

 doi:10.20944/preprints202105.0736.v1

29. Bae, Y. J., & Hyeon, I. S. Sports activity and subjective health recognition of the elderly in community senior centers. *The Korean Journal of Sport* **2016**, *14*(3), 535-543.