

University Students' Experiences with Hybrid Physical Education Classes During COVID-19: A Qualitative Analysis of 2021 Survey Data

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Abstract

In this study, the authors conducted a questionnaire survey of 522 students (131 male and 391 female) enrolled in a practical physical education compulsory subject that combined face-to-face and on-demand learning methods. The open-ended responses (opinions and impressions about the class in general) were subjected to qualitative analysis and classified into four categories (positive, negative, both, and other). The relationship of response categories with gender and awareness of exercise and sports was examined. The results showed a notable gender difference in the three categories (excluding "other"). Among males, the highest proportion of responses fell under "positive," "negative," and "both," in that order. Among females, the highest proportion of responses fell under "positive," "both," and "negative," in that order. The proficiency scores of students for exercise and sports were highest in order of "negative," "both," and "positive" responses, indicating that students who are good at and like sports have more negative opinions. There was no difference in the scores of liking. Even in classes that are primarily on-demand, it is possible to receive "positive" evaluations by incorporating interactive approaches and providing a diverse range of materials.

1. Introduction

The novel coronavirus disease (COVID-19) pandemic has had a profound impact on the world, forcing widespread adoption of self-isolating lifestyles. Although COVID-19 had been downgraded from a "Class 2 infectious disease" to a "Class 5 infectious disease" in May 2023, the virus continues to persist with widespread concerns about its long-term effects¹⁾. A survey of university students revealed a decline in physical activity since the onset of the COVID-19 pandemic²⁾. Notably, the survey found a direct correlation between reduced step counts and increased likelihood of depression³⁾. University physical education plays a vital role in fostering the mental and physical health of students. However, the COVID-19 pandemic necessitated a shift toward remote learning, even though the authors mainly offer face-to-face learning. A survey of university general physical education class formats for the first term (spring semester) of the fiscal

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year 2021⁴⁾ revealed that 46.6% were conducted "face-to-face only," while 38.9% involved "combined face-to-face and on-demand remote learning." Other formats included "on-demand remote learning only" (20.6%) and "combined face-to-face and real-time remote learning" (15.3%). These findings indicated that more than half of universities and junior colleges have incorporated remote learning into their physical education programs.

A survey of remote learning incorporating a physical activity promotion program (which included endurance exercise, resistance training, and stretching) revealed high student satisfaction in the overall evaluation⁵⁾. However, the learning outcomes (subjective benefits, physical activity) of on-demand remote learning were lower than those of face-to-face learning (pre-COVID-19) and real-time learning. This phenomenon was more pronounced among students who were indifferent to exercise⁶⁾. Thus, despite achieving certain learning outcomes, remote learning—a novel experience for most universities—has brought to light several issues that warrant consideration.

When it comes to evaluating classes, both lecturers (teachers) and the participants (students) offer valuable perspectives. While quantitative^{7,8)} and qualitative⁸⁾ analyses of student evaluations of classes are common, there is a paucity of qualitative analyses of a practical physical education subject^{9,10)}. This study aimed to consider this opinion contrast by conducting a questionnaire survey among students enrolled in a practical physical education compulsory subject that combined face-to-face and on-demand learning methods. The open-ended responses were qualitatively analyzed to explore relationships with gender and awareness of exercise and sports. Additionally, the authors highlighted some representative descriptions.

2. Methods

2.1 Participants

The survey subjects were 522 students (131 male, 391 female) enrolled in a practical physical education compulsory subject offered to first-year students at K University in Okayama Prefecture in the spring and fall semesters of 2021. Subjects responded to the free descriptions (open-ended responses) section of the general class questionnaire. The response rate was 60.3% (55.0% male, 62.4% female) of all students.

2.2 Class contents

This class combined face-to-face and on-demand learning. Face-to-face sessions were held four times (first, second, midterm, and final) supplemented by 14 weeks of on-demand remote learning. The in-person sessions covered course content explanations, a question-and-answer (Q and A) session, and stretching exercises. During the first session, students received a 14-week exercise log (consisting of 4 A4-sized sheets) to record their daily exercise content and weekly exercise time. They also received instructional materials on basic stretching and resistance exercises. Fitness-related materials (21 still images, 28 videos [13 still images and videos with the same theme], 1 PowerPoint presentation) were distributed through the e-Learning system every Monday for 14 weeks. The materials covered 6 stretching exercises, 7 resistance exercises, 9 aerobic exercises, 2 comprehensive exercises, and 12 other exercises (Table 1). Students were required to watch the provided materials, perform exercises (with the option to only watch exercises that were difficult to practice), and submit their impressions through the system. They were also expected to keep a record of their exercises. Considering the differences in students' physical strength, condition, and preferences, they were allowed to record their self-style exercises and those learned through video streaming services such as YouTube. This approach aimed to foster voluntary, active, and enjoyable engagement in physical activities. Throughout the course, teachers took every opportunity to encourage the students to practice at their own pace, tailored to their physical fitness levels.

The recommended weekly exercise time was at least 70 minutes (equivalent to a minimum of 10 minutes a day). Efforts were made to share information between teachers and students and among students by developing a "Q and A" section to address student queries. Additionally, "My Ingenuity for Exercising" and "My Recommendation to other Students" sections were developed based on inputs from various students. The first two recording sheets were collected in the midterm class, and the last two sheets were collected

Table 1 Fitness-related materials through the e-Learning system

Type of exercise	Contents
Stretching	Stretching (floor edition, chair edition, standing edition) Stretching for improving lower back pain Static stretching for different parts, Easy yoga
Resistance exercise	Resistance exercise (basic edition) Lower limb training (low load edition, high load edition) Core training (balance exercise, push-ups, plank / bird dog) 7 push-and-press exercises for 1 minute
Aerobic exercise	Radio calisthenics No. 1 (Saga dialect) and No. 2 (Tsugaru dialect) Radio calisthenics No. 3, What is Radio calisthenics ? Easy aerobic dance, Walking and slow jogging Chair exercise, Air bicycle pedaling exercise Judo aerobics, Cosmos gymnastics
Comprehensive exercise	Circuit exercise while seated, Circuit exercise while standing
Other exercises	Exercises while introducing three staff members Exercises for improving posture (draw-in) Exercises to improve balance ability "3 Breaths and 1 Breath Method" to strengthen respiratory muscles Refresh with abdominal breathing ! Relaxation method for mind and body How to release the force "Would you like to try relaxation ?" 3-minute exercise to relieve eye, shoulder, and neck fatigue T&S-shaped exercise and swing the arms "Shuai shou" Eight brocade tai chi (1, 2, 3, 6 brocade) Self massage sitting on the floor, Self-massage in a chair
Total number of materials: 21 still images, with 13 having the same theme; 28 videos, with 13 having the same theme and 1 PowerPoint presentation Video (including PowerPoint) time : maximum=9' 17", minimum=2' 31", average=5' 29"	

at the final class (in the spring semester, the midterm class was canceled due to the declaration of a state of emergency, and the four sheets were collected at the final class). The anonymized questionnaire survey was conducted in paper form at the final class.

2.3 Analysis procedures

Regarding the free descriptions, the authors employed qualitative analysis methods^{11,12)} to identify and organize similar words and phrases into keywords. The authors then classified these keywords into four categories: "positive (satisfaction/fulfillment)" (hereafter, positive), "negative (dissatisfaction/disappointment)" (hereafter, negative), "negative but also positive, or positive but also negative" (hereafter, both) and "other." The specific work steps¹⁰⁾ involved entering descriptive text into an Excel file and printing, underlining key sentences in the printed text, highlighting the same sentences in the Excel file, identifying keywords by

carefully reviewing written and electronic data, and classifying the descriptive sentences. These tasks were performed by two researchers.

2.4 Questionnaire

Students were asked about their awareness of exercise and sports using a four-point scale from the viewpoints of proficiency (Are you good at exercising and playing sports?) and liking (Do you like exercising and playing sports?). The proficiency level was answered as "good" (4 points), "somewhat good" (3 points), "somewhat not good" (2 points), or "not good" (1 point). The level of liking was answered as "like" (4 points), "somewhat like" (3 points), "somewhat dislike" (2 points), or "dislike" (1 point).

2.5 Statistical analysis

The Chi-square test was used to analyze the relationship between the four categories and gender. The Kruskal-Wallis test was used to analyze the relationship between the three categories (excluding "other") and the scores of proficiency and liking for exercise and sports. When significant differences were found, the Bonferroni/Dunn post-hoc test was used for comparison. Statistical analyses were performed using IBM SPSS version 23.0, and p-values less than 5% were considered indicative of statistical significance.

3. Results and Discussion

3.1 Quantitative results and discussion

Table 2 shows the keywords from the free descriptions corresponding to the three categories excluding "other". Table 3 shows the number of respondents in each category. The "positive" category had the highest number of students, with 95 males (72.4%) and 282 females (72.1%). The "negative" category consisted of 12 males (9.2%) and 15 females (3.8%). The "both" category included 4 males (3.1%) and 37 females (9.5%). The "other" category comprised 20 males (15.3%) and 57 females (14.6%). There was a significant difference in the response ratio between males and females ($p < 0.05$). Table 4 shows the relationship between the three categories and the scores for proficiency and liking for exercise and sports, combining data from both males and females. Values are shown as the number of respondents (%) and mean \pm standard deviation (SD). The proficiency scores were 2.62 ± 0.99 for the "positive" category, 3.15 ± 0.86 for the "negative" category, and 2.78 ± 0.99 for the "both" category, with the "negative" category showing a significantly higher proficiency score than the "positive" category ($p < 0.05$). The liking scores were 3.23 ± 0.90 for "positive," 3.56 ± 0.7 for "negative," and 3.37 ± 0.89 for "both," with no significant differences between the three categories.

In the 2020 survey¹⁰⁾, the "positive" category accounted for 51.4% (41.4% male, 54.6% female), while the 2021 results showed that more than 70% of both males and females were in the "positive" category. This may be attributable to several factors. First, the content was enriched and the number of deliveries increased, catering to students with diverse physical fitness levels, exercise habits, and preferences. Efforts were made to enhance the clarity of materials by adding subtitles to the videos and explanatory still images wherever possible. Furthermore, the readability of materials was improved by combining "Q and A" and "My Ingenuity and Recommendation" sections into a single illustrated screen, replacing bulleted sentences.

Although the rate of "negative" was relatively low, at less than 10%, a notable gender difference emerged, with females exhibiting a lower rate of "negative" compared to males. Previous research suggests that males tend to prefer sports-oriented exercise, while females prefer fitness-oriented exercise¹³⁾. Given that the class materials focused on fitness exercises that can be done individually at home, it is reasonable to assume that this format may have been less appealing to males, resulting in a higher rate of "negative" responses among males compared to females. As shown in Table 4, students with more "negative" attitudes tended to have higher proficiency levels in exercise and sports. This suggests that students who are good at exercise and sports may have a strong preference for sharing time and space with others and engaging in face-to-face learning experiences, which are commonly found in elementary, junior high, and high school settings.

Table 2 The keywords from the free descriptions corresponding to the three categories

Categories	Keywords	
Positive (Satisfaction, Fulfillment)	I had fun. I felt good. I had a good opportunity to exercise. I started liking exercise. I was able to improve my mood. I thought it would be easy to practice. I was able to exercise at my own pace. I was able to expand my exercise repertoire. I was able to acquire the habit of exercising. I began to feel less uncomfortable about exercise. I was able to accumulate knowledge about exercise that I didn't know. I was able to expand my perspective on health and physical fitness.	I was amused. I thought it was helpful. I worked on it with excitement. I never got bored. Solving lack of exercise Time to rest, Healing, Relaxation Fulfilling class content Meaningful class
Negative (Dissatisfaction, Disappointing)	I was disappointed that there were no face-to-face classes. I wanted to have more face-to-face classes. I wanted to play more ball games. I wanted to play a variety of sports. I thought it was more fun to exercise together. I felt uncomfortable conducting physical education remotely. I thought the quality has declined because classes are not face-to-face.	
Negative but also positive or Positive but also negative	I was disappointed, I was lonely, I wanted to have face-to-face classes, I wanted to exercise together,	but <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> I had fun. I was amused. I thought it was helpful. I thought it was a good opportunity. I was able to actively participate. I felt rewarded. </div>

Table 3 The number of students in each category

Categories	Total (n=522)	Male (n=131)	Female (n=391)	Analysis
Positive	377 (72.1)	95 (72.4)	282 (72.1)	
Negative	27 (5.2)	12 (9.2)	15 (3.8)	$\chi^2(3)=10.54$ p=0.014
Both	41 (7.9)	4 (3.1)	37 (9.5)	
Other	77 (14.8)	20 (15.3)	57 (14.6)	

Numbers (%), Statistical analysis: Chi-square test (Male vs. Female)

Table 4 The relationship between the three categories and the scores of proficiency and liking for exercise and sports

Items	Scores & Answers	Positive (n=377)	Negative (n=27)	Both (n=41)	p-value	Multiple comparisons
Proficiency	4. Good	83 (22.0)	10 (37.0)	10 (24.4)	0.014	Positive < Negative
	3. Somewhat good	123 (32.6)	13 (48.2)	18 (43.9)		
	2. Somewhat not good	114 (30.2)	2 (7.4)	7 (17.1)		
	1. Not good	57 (15.2)	2 (7.4)	6 (14.6)		
	Mean \pm SD	2.62 \pm 0.99	3.15 \pm 0.86	2.78 \pm 0.99		
Liking	4. Like	181 (48.0)	17 (63.0)	24 (58.5)	0.118	
	3. Somewhat like	126 (33.4)	9 (33.3)	10 (24.4)		
	2. Somewhat dislike	46 (12.2)	0 (0)	5 (12.2)		
	1. Dislike	24 (6.4)	1 (3.7)	2 (4.9)		
	Mean \pm SD	3.23 \pm 0.90	3.56 \pm 0.70	3.37 \pm 0.89		

Numbers (%), SD: Standard Deviation, Statistical analysis: Kruskal-Wallis test and post-hoc test (Bonferroni/Dunn)

3.2 Observations from the free description

A selection of opinions and impressions from the free descriptions are presented in Table 5. A positive response was, "The smiling teachers in the video energized me as I live alone. It was easy for me to exercise because the teacher counted the numbers and provided detailed instructions." The basic principles of this class were to "present materials in an easy-to-understand manner" and "to have students enjoy exercising without getting bored." It would be gratifying for the teachers to know that the distributed materials contributed to the students' continued exercise habits. Some comments included family support such as, "I was able to learn about various stretches and taught them to my grandmother who has bad back pain." Some commented that they had exercised together with family members. This aligns with the Active Guide's recommendation¹⁴⁾, which encourages people with exercise habits to "Act together!" by exercising with family members or friends. The ultimate goal is for all students to recognize the importance of exercise and progress beyond the indifference stage of behavioral change. This involves advancing through the stages of interest, preparation, and action (within 6 months of changing behavior), and ultimately reaching the maintenance stage (6 months or more after changing behavior)¹⁵⁾. Ultimately, students will become more mindful of the value of sharing exercise experiences with others.

A negative response was, "It's lonely doing gymnastics and exercise alone, and I think it would be more fun to do it together. If it were not for the coronavirus pandemic, I believe I would have been able to get along better with my teachers and enjoy my classes more." University physical education is expected to foster essential life skills, including effective communication, cooperation, and collaboration⁴⁾. It also promotes supportive interactions, sportsmanship, and basic social skills, while encouraging self-reflection. However, a survey of teachers revealed significant limitations of remote learning, particularly in conveying the value of cooperative play and improving communication skills¹⁶⁾. Notably, students who prefer face-to-face learning, which integrates cooperative play and communication, tend to find remote learning less engaging and are more likely to give negative responses.

A both response was, "Although it was a shame that we could not do it face-to-face, I found the videos of the teachers' ingenious ideas interesting and enjoyable." Thus, many students expressed that while they would have preferred face-to-face learning under normal circumstances, they appreciated the creativity and resourcefulness of their teachers in adapting to remote learning amidst the COVID-19 pandemic. The

distributed materials included exercises, gymnastics, self-massage, and other topics that would not have been taught in elementary, junior high, or high school, and these were also likely evaluated as "interesting" and "appreciable."

Other responses highlighted the mental health benefits of exercise, with one student noting, "I feel that exercising has helped stabilize my mental health." Notably, some students recognized the positive impact of exercise on their mental well-being¹⁷⁾ during the coronavirus pandemic, a time when outdoor activities were restricted.

Table 5 A selection of opinions and impressions from the free descriptions

Categories	Contents
Positive	<ul style="list-style-type: none"> • The smiling teachers in the video energized me as I live alone. It was easy for me to exercise because the teacher counted the numbers and provided detailed instructions. (Female) • I'm not good at exercise or sports, so I was saved by having VOD classes instead of face-to-face classes. I was able to enjoy the lectures to the very end without any mental stress. (Female) • I was able to learn about various stretches and taught them to my grandmother who has bad back pain. (Male) • There are many exercises useful in daily life that I didn't learn in high school, and since no equipment was required, it was great to be able to exercise with my family. (Female) • Through this class, I realized once again the importance of exercise. Staying at home or sitting in a chair all the time made me feel stressed and weakened my muscles, but resistance exercises, radio calisthenics, and relaxation techniques calmed my body and mind. (Female)
Negative	<ul style="list-style-type: none"> • It's lonely doing gymnastics and exercise alone, and I think it would be more fun to do it together. If it were not for the coronavirus pandemic, I believe I would have been able to get along better with my teachers and enjoy my classes more. (Female) • I wanted to do it in face-to-face learning because I would be too lazy to exercise if I were taking remote learning. (Female)
Both	<ul style="list-style-type: none"> • Although it was a shame that we could not do it face-to-face, I found the videos of the teachers' ingenious ideas interesting and enjoyable. (Female) • Actually, I wanted to exercise together face-to-face. However, by exercising alone at home, I didn't feel embarrassed, and I was able to exercise by trial and error. I think it was better to enjoy it to the fullest. (Female) • I was able to change my attitude toward exercise considerably even online, so I felt that I would be in a better direction if I could do it face-to-face. During the sessions with videos, I felt like I was going along with the teachers, and it felt very comfortable. (Male)
Other	<ul style="list-style-type: none"> • I feel that exercising has helped stabilize my mental health. (Female) • I realized that it is important to take care of the body and mind as a set in order to keep my health. (Female) • I got the impression that there were a lot of light, healthy movements that weren't so stoic. I can't help but see this as a warm video (a heart-warming video), as it seems like there is a desire to make it easy for beginners to begin exercising. (Female)

3.3 Features and applicability of on-demand remote learning

The advantages of on-demand remote learning include the elimination of commuting to the university^{18,20)}, flexibility in terms of time or place^{18,20)}, and the ability to watch the class materials repeatedly^{18,20)}. In the context of physical education, remote learning offers additional advantages such as the opportunity to

learn new exercises that may not be part of one's usual routine⁷⁾ and the freedom to practice without self-consciousness or concern about being seen by others.

On the other hand, the disadvantages include an excessive number of report assignments^{18,20)}, difficulty in seamless communication between teachers and students as well as among students¹⁹⁾, feelings of loneliness¹⁹⁾, and delays in providing advice and feedback to students. It appears that the disadvantages specific to physical education (difficulty in communication, feeling of loneliness, delayed feedback) can be largely mitigated by promptly providing "Q and A" and "My Ingenuity and Recommendation." Additionally, the on-demand remote learning approach employed in this class can be fully leveraged in the event of unforeseen circumstances in the future, provided that there are no restrictions on face-to-face classes or sports activities. This seems possible by modifying the syllabus, regardless of whether it is a compulsory or elective subject.

3.4 Thoughts after finishing classes during the coronavirus pandemic

As most teachers and students were experiencing remote learning for the first time, analyzing students' open-ended responses provided valuable insights into their genuine thoughts and feelings²¹⁾, which might not have been expressed in face-to-face learning. The diverse opinions provided a good opportunity to consider the role of physical education as a compulsory subject. It seems important to increase class satisfaction even after returning to face-to-face learning and provide information on exercises that can be utilized after entering the workforce.

3.5 Study limitations

Some limitations of this study should be acknowledged. A significant proportion of students (39.7%) did not respond to the survey, leaving their opinions and impressions unknown. Encouraging students to provide more detailed responses in the free descriptions section might have mitigated this issue. Moreover, even among respondents, the content provided may not fully capture their thoughts and feelings. Thus, the findings may not be entirely generalizable to the entire class.

4. Conclusion

In this study, the authors conducted a questionnaire survey of students enrolled in a practical physical education compulsory subject that combined face-to-face and on-demand learning methods. A qualitative analysis of the open-ended responses was performed to examine their relationship with gender and awareness of exercise and sports. The results showed that males were more likely to respond with "positive," "negative," and "both" opinions, in that order. Females were more likely to respond with "positive," "both," and "negative" opinions, in that order. Proficiency scores of exercise and sports were highest in order of "negative," "both," and "positive." These findings suggest that even in classes that are primarily on-demand, it is possible to obtain "positive" evaluations by incorporating interactive approaches and providing a wide variety of materials.

Ethical considerations

This study was approved by the Ethics Committee of Kawasaki University of Medical Welfare (No. 21-031).

Conflict of interest

The authors declare no conflict of interest.

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References

1. Ministry of Health, Labour and Welfare : *For those who have been infected with the new coronavirus infection.*

- <https://www.mhlw.go.jp/content/10900000/001159544.pdf>, 2023. (January 19, 2024) (In Japanese, translated by the author of this article)
2. Gallo LA, Gallo TF, Young SL, Moritz KM and Akison LK : The impact of isolation measures due to COVID-19 on energy intake and physical activity levels in Australian university students. *Nutrients*, 12(6), 1865-1878, 2020.
 3. Giuntella O, Hyde K, Saccardo S and Sadoff S : Lifestyle and mental health disruptions during COVID-19. *Proceedings of the National Academy of Sciences of the United States of America*, 118(9), e2016632118, 2021.
 4. Murayama M, Teraoka E, Nagata N, Higashihara A, Fukushi N, Inami T, Okuyama S, Shimizu K and Sasaki R : Assessment practices in physical education at universities: A response to the shift to remote class during the COVID-19 pandemic. *Japanese Journal of Physical Education and Sport for Higher Education*, 20, 99-109, 2023. (In Japanese with English abstract)
 5. Suzuki H, Kobayashi Y, Ota A, Takamaru I, Kurasaki N, Edamatsu C, Suga M, Sumimoto A, Shitara K and, ...Ito T : The effectiveness of Okayama University program during expansion period of COVID-19 infection. *Japanese Journal of Physical Education and Sport for Higher Education*, 18, 49-55, 2021. (In Japanese with English abstract)
 6. Nishida J, Kiuchi A, Nakayama S, Namba H, Sonobe Y, Nishiwaki M, Hiraku S, Nakada M, Nishigaki K and, ...Tahara R : An examination of the contributing factors on learning outcomes of "On-Demand format" university physical education practical courses during the COVID-19 pandemic occurrence: Focused on the stages of exercise behavior change. *Japanese Journal of Physical Education and Sport for Higher Education*, 19, 1-14, 2022. (In Japanese with English abstract)
 7. Nishida J, Kiuchi A, Nakayama S, Namba H, Sonobe Y, Nishiwaki M, Hiraku S, Kobayashi Y, Nishigaki K and, ...Tahara R : Learning outcomes of university physical education courses immediately after the first wave of the COVID-19 pandemic occurrence: Verification of remote learning on the perceived benefits and physical activity. *Japanese Journal of Physical Education and Sport for Higher Education*, 18, 2-20, 2021. (In Japanese with English abstract)
 8. Higuchi H, Etchu K, Kubo J, Taira M, Tabata T, Nashimoto Y and Honzu M : On-line classes at university under COVID-19 pandemic: Based on the quantitative and qualitative analysis of the survey. *Bulletin of Miyagi University of Education, Graduate School for Teacher Training*, 2, 53-72, 2020. (In Japanese)
 9. Azumi A and Kitamura K : Qualitative analysis of proficiency experience with novice skiers: Through SCAT analysis of reflective writing of university students participating in ski practice. *Japan Society of Sports Industry*, 33(1), 9-25, 2023. (In Japanese with English abstract)
 10. Bunya T and Monri T : Class evaluation by students of university physical education practical subjects mainly using remote learning: Qualitative classification of free-description questionnaires conducted in 2020 under the COVID-19 epidemic. *Kawasaki Medical Welfare Journal*, 33(2), 305-314, 2024. (In Japanese with English abstract)
 11. Kawakita J : *Idea generation method: For developing creativity*. Chuokoron-Shinsha, Tokyo, 1967. (In Japanese, translated by the author of this article)
 12. Kitamura K : What college physical education could do through online lessons in the COVID-19 pandemic: A qualitative analysis of students' view of university physical education course. *Japanese Journal of Physical Education and Sport for Higher Education*, 18, 35-48, 2020. (In Japanese with English abstract)
 13. Monri T, Bunya T and Miyakawa T : A consideration of the compulsory physical education subjects consisting of three categories of exercise: Relationship between awareness of exercise and sports and understanding after taking the course. *Kawasaki Medical Welfare Journal*, 31(2), 465-475, 2022. (In Japanese with English abstract)
 14. Ministry of Health, Labour and Welfare : *Active Guide (Japanese official physical activity guidelines for health promotion)*. <https://www.mhlw.go.jp/stf/houdou/2r9852000002xple-att/2r9852000002xpr1.pdf>, 2013. (March 17, 2021) (In Japanese, translated by the author of this article)
 15. Oka K : Stages of change for exercise behavior and self-efficacy for exercise among middle-aged adults.

- Japanese Journal of Public Health*, 50(3), 208-215, 2003. (In Japanese with English abstract)
16. Namba H, Sato Y, Sonobe Y, Nishida J, Kiuchi A, Kobayashi Y, Tahara R, Nakada M, Nakayama S and, ... Hiraku S : Verification of the educational effect of online university physical education with COVID-19 from the perspective of teachers. *Japanese Journal of Physical Education and Sport for Higher Education*, 18, 21-34, 2020. (In Japanese with English abstract)
 17. Kawashiri T, Sato S, Suzuki T and Yamaguchi M : Correlation between continuation of habitual workouts and mental health among university students. *Kanazawa Institute of Technology Progress*, 24, 173-181, 2016. (In Japanese with English abstract)
 18. Orito Y, Sai H, Okamoto Takashi, Okamoto Tadayuki, Soga N and Tachibana Y : A questionnaire survey on the impact of COVID-19 on university students: Can university students return to life before COVID-19? *Journal of the Faculty of Collaborative Regional Innovation, Ehime University*, 7(1), 11-29, 2023. (In Japanese with English abstract)
 19. Hashimoto K : The academic survey by students who have taken both online instruction and face-to-face instruction by the spread of COVID-19. *The Bulletin of Ryotokuji University*, 16, 137-150, 2022. (In Japanese with English abstract)
 20. Nishimoto M and Emi K : Text-mining analysis of what students think about online and face-to-face classes on account of COVID-19. *JSiSE Research Report*, 36(6), 109-114, 2022. (In Japanese)
 21. Nakajima T : A study about the remote class in the corona misfortune: Taking the actual technique system subject of physical education and a sport for instance. *Bulletin of the Niigata Chuoh Junior College*, 72, 85-111, 2021. (In Japanese)