



Exploring medical students' perception of non-face-to-face theory and face-to-face laboratory classes during COVID-19 pandemic: focusing on anatomy course

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Purpose: This study investigated students' perceptions of non-face-to-face theory classes and face-to-face laboratory classes conducted in anatomy courses at medical schools during the coronavirus disease 2019 pandemic.

Methods: This study utilized a questionnaire to assess self-reported academic achievement level, satisfaction with non-face-to-face theory classes, satisfaction with face-to-face laboratory classes, and self-directed learning level, and conducted difference verification and regression analysis for 51 students who took anatomy courses from the fall semester of 2020 to the spring semester of 2021.

Results: The group with a high self-reported academic achievement level was more satisfied with the non-face-to-face theory classes than the group with a low self-reported academic achievement level. The group with a high self-reported academic achievement level had a higher self-directed learning level than the group with a low self-reported academic achievement level. In addition, it was found that the higher the self-directed learning level, the higher the satisfaction with non-face-to-face theory classes.

Conclusion: These results suggest that to enhance satisfaction with non-face-to-face theory classes in an anatomy course, a favorable class environment that can increase the self-directed learning level is needed. In particular, careful concern is required when designing non-face-to-face classes for students with a low self-reported academic achievement.

Key Words: COVID-19, Anatomy, Self-directed learning

Introduction

In December 2019, a novel beta-coronavirus called severe acute respiratory syndrome coronavirus 2 was reported in Wuhan, China. This infectious disease was named coronavirus disease 2019 (COVID-19), which was declared a pandemic by the World Health Organization. Many schools switched classes from offline to online using

various edu-techs such as video conference platforms in accordance with social distancing orders [1]. Following this trend, many medical schools and faculties have had to radically change their traditional teaching methods. As such, the COVID-19 pandemic has disrupted medical education but has provided an opportunity to reflect on and improve the practices of education [2].

In particular, from the perspective of medical schools, human anatomy is a fundamental subject in the under-

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standing of all subjects of medicine, and it is an essential prerequisite for reasoning regarding the symptoms of diseases and planning appropriate treatment. However, many medical students have difficulties achieving a complete understanding of the three-dimensional structure of the body based solely on textbooks [3]. Therefore, cadaver dissection has been the traditional education method to supplement students' understanding [4]. During the COVID-19 pandemic, most medical schools in Korea conducted anatomy theory classes online, while the dissection class was conducted offline in an incomplete manner [5].

As of March 2022, three articles were searched for and found with the keywords 'anatomy' and 'COVID' utilizing the Research Information Sharing Service to investigate anatomy education at medical schools in Korea in the context of COVID-19. Lee [6] reported on the effective use of laboratory class time required for formative evaluation to introduce flipped learning focusing on cross-sectional neuroanatomy lab classes. Jung et al. [5] surveyed 314 medical students from nine medical schools functioning under COVID-19 circumstances. The results focused on the practice timing, operational method, and satisfaction level regarding the practice [5]. Lee et al. [7] conducted a divided-group cadaver lab due to COVID-19, and they concluded that this type of group lab class can be employed even if the COVID-19 pandemic comes to an end. As such, most research on anatomy education at medical schools in the context of COVID-19 in Korea focuses on the operation of laboratory classes rather than the overall satisfaction of anatomy education.

On the other hand, as of March 2022, 299 articles were searched for and found with the keywords of 'anatomy,' 'COVID,' and 'education' in PubMed. These studies generally reported on research regarding the educational design of new educational tools or theories [3] or educational methods [1,8]. However, most of the studies

focused on the effects of a specific intervention, and it was difficult to find a study that analyzed the current situation due to COVID-19 in terms of anatomy class satisfaction as well as achievement level according to educational design and method.

During the COVID-19 pandemic, most anatomy education in South Korea was conducted in non-face-to-face theory classes and face-to-face laboratory classes [9]. In non-face-to-face classes, self-directed learning shows a quantitative correlation with academic achievement [10] and has a positive effect on learning flow and life satisfaction [11]. In addition, since self-directed learning is a strong influence on learning motivation, it is an essential requirement for laboratory classes in anatomy [12]. Therefore, the purpose of this study was to investigate the perception of students who completed anatomy classes during COVID-19 based on self-reported academic achievement level, class satisfaction with regard to theory and laboratory, and self-directed learning level.

Methods

1. Participants

This study was conducted on 51 students who took anatomy courses from the fall semester of 2020 to the spring semester of 2021. The medical school where this study was conducted consists of a 6-year program from M1 to M6. In the fall semester of the M2, students are studying gross anatomy and histology in the subject called "structure of the human body". And then, in the spring semester of the M3, students are studying neuroanatomy in the subject called "basic neuroscience". However, in the 2020 and 2021 academic years, all theory classes were conducted in a non-face-to-face manner due to the COVID-19 pandemic. The participants of the study were

30 male students (63.83%) and 17 female students (36.1%), after excluding four insincere questionnaire submissions.

2. Development of the survey

One medical education expert and three anatomy experts gathered to create a questionnaire for this study after meeting more than four times to explore student perceptions in anatomy course conducted in the COVID-19 pandemic (Appendix 1). The questionnaire for this study consisted of elements regarding self-reported academic achievement level, satisfaction with non-face-to-face theory classes using Zoom, satisfaction with face-to-face laboratory classes, self-directed learning level, and the reasons for satisfaction with each class. Students were asked to select one of the high, medium, and low self-reported academic achievement levels. Satisfaction with non-face-to-face theory classes, satisfaction with face-to-face laboratory classes, and self-directed learning levels were measured on a 5-point Likert scale, and the reasons regarding satisfaction with each class were also submitted in a frank manner.

3. Data analysis

All surveys were conducted online using Google Forms. Forty-seven submitted replies to the questionnaire were analyzed. Four submissions were excluded as the answers were deemed to be insincere. In this study, the following analysis was conducted to investigate the students' perception of anatomy classes in the context of the COVID-19 pandemic. To substantiate whether there was any difference between satisfaction levels regarding non-face-to-face theory classes and face-to-face laboratory classes, a paired t-test was conducted. In order to check the differences in satisfaction with regard to non-face-to-face theory classes, satisfaction with face-to-face laboratory classes, and self-directed learning levels according to self-reported academic achievement

levels, a K-independent sample test of non-parametric statistics was conducted. A Bonferroni post-hoc test was used when significant differences were reported. Finally, to determine the effect of self-directed learning levels on the satisfaction with non-face-to-face theory classes and satisfaction with face-to-face laboratory classes, regression analysis was performed. This study employed the IBM SPSS ver. 21.0 (IBM Corp., Armonk, USA), and values were considered statistically significant when $p < 0.05$.

4. Ethics statement

This study was approved by the Institutional Review Board (IRB) of Eulji University (approval no., EU21-87). The IRB of Eulji University waived the need for explicit consent from participants.

Results

1. Student satisfaction with anatomy course in COVID-19

To determine whether there was any difference between satisfaction with non-face-to-face theory classes and satisfaction with face-to-face laboratory classes, a paired t-test was performed (Table 1). There was no significant difference between them ($t=0.342$, $p>0.05$).

2. Differences in student perceptions according to self-reported academic achievement level

To determine if there was any difference in satisfaction with non-face-to-face theory classes, satisfaction with face-to-face laboratory classes, and self-directed learning levels according to the self-reported academic achievement levels, a K-independent sample test was conducted (Table 2). There were significant differences

Table 1. Student Satisfaction with Anatomy Course in COVID-19

Variable	No. of students	Mean ± SD	t-value	p-value
Student Satisfaction with Anatomy Course in COVID-19			0.342	0.734
Non-face-to-face theory classes satisfaction	47	3.81 ± 1.04		
Face-to-face laboratory classes satisfaction	47	3.72 ± 1.10		

COVID-19: Coronavirus disease 2019, SD: Standard deviation.

Table 2. Differences in Student Perceptions according to Self-reported Academic Achievement Level

Variable	Self-reported academic achievement level mean rank			Kruskal-Wallis's H	p-value	Post-hoc
	High group (N=13)	Middle group (N=23)	Low group (N=11)			
Non-face-to-face theory classes satisfaction	31.270	23.370	16.730	7.750	0.021	High>low group
Face-to-face laboratory classes satisfaction	24.770	27.130	16.550	4.914	0.86	
Self-directed learning level	34.000	22.760	14.770	14.500	0.001	High>middle, low group

Table 3. Effect of Self-directed Learning Level on Classes Satisfaction

Item	B	SE	β	t-value	p-value
Non-face-to-face theory classes satisfaction					
(Constant)	2.280	0.616		3.699	0.001
Self-directed learning level	0.443	0.174	0.355	2.549	0.014
Face-to-face laboratory classes satisfaction					
(Constant)	4.398	0.691		6.361	0.000
Self-directed learning level	-0.196	0.195	-0.148	-1.003	0.321

SE: Standard error.

in satisfaction with regard to non-face-to-face theory classes and self-directed learning levels according to self-reported academic achievement levels ($p < 0.05$). However, no significant difference was found in satisfaction with regard to face-to-face laboratory classes ($p > 0.05$). As a result of the Bonferroni post-hoc test to determine whether there was any difference in satisfaction between the non-face-to-face theory classes and the self-directed learning levels according to specific self-reported academic achievement levels, in terms of satisfaction with non-face-to-face theory classes, the group with a 'high' level of academic achievement had higher levels of satisfaction than the 'low' academic achievement group. The self-directed learning level was higher in the 'high' group than in the 'middle' and 'low' groups with regard to self-reported academic achievement

levels. The reasons for the low satisfaction with non-face-to-face theory classes in the 'low' group of self-reported academic achievement levels were identified as being associated with difficulties in understanding anatomy theory classes or reduced concentration in the environment of non-face-to-face classes.

3. Effect of self-directed learning level on satisfaction with classes

To examine the effect of self-directed learning levels on satisfaction with non-face-to-face theory classes and satisfaction with face-to-face laboratory classes, regression analysis was performed with the self-directed learning levels as an independent variable and the other factors as a dependent variable (Table 3). The effect of self-directed learning levels on satisfaction with non-

face-to-face theory classes was statistically significant ($B=0.44$, $p<0.05$). Therefore, as self-directed learning level increases, satisfaction with non-face-to-face theory classes was also found to increase. However, there was no statistically significant difference in the effect of self-directed learning levels on satisfaction with face-to-face laboratory classes ($p>0.05$).

Discussion

During the COVID-19 pandemic, many medical schools have conducted most of their classes online. However, anatomy classes had, in part, to be conducted face-to-face because of the technical limitations of online laboratory classes and because the effectiveness of such classes could not be completely verified. In other words, the special circumstances with regard to COVID-19 made it possible to utilize both online and offline resources in anatomy education. Therefore, this study analyzed students' satisfaction with non-face-to-face theory classes and face-to-face laboratory classes with regard to anatomy courses from the learner's perception with respect to self-reported academic achievement level and self-directed learning level.

As a result, there was no statistically significant difference between satisfaction with non-face-to-face theory classes and face-to-face laboratory classes, but it was confirmed that students with high self-reported academic achievement levels had higher satisfaction with non-face-to-face theory classes than students with low self-reported academic achievement levels. These results are similar to a study of nursing students [13] and a study of physical education college students [14] during the COVID-19 pandemic. In the non-face-to-face theory classes, students with low self-reported academic achievement levels complained that it was difficult to

understand the class content itself or that they had difficulty concentrating for the entire class because they were utilizing a monitor.

In addition, it was found that students with high self-reported academic achievement levels had a higher level of self-directed learning than students with medium or low self-reported academic achievement levels. In this study, the students measured their self-directed learning level themselves. Therefore, it is required to identify methods to improve self-directed learning ability and enhance the class atmosphere to bolster self-confidence and perceived levels of such ability.

It is difficult to extrapolate or generalize based on this study because it was conducted in only one medical school with the aim of comparing satisfaction levels with regard to non-face-to-face theory classes and face-to-face laboratory classes according to self-reported academic achievement levels, in specific subject classes such as anatomy education during the COVID-19 pandemic. And there was a limitation in that the analysis was not conducted independently of the somewhat contrasting circumstances pertaining to comparisons between theory classes and laboratory classes, face-to-face education, and non-face-to-face education. However, it is anticipated that the study will be helpful in terms of reporting students' perceptions of anatomy classes during COVID-19, designing virtual anatomy classes online, or introducing new educational methods such as blended learning or flipped learning.

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Appendix 1. Student Awareness Questionnaire about Anatomy Course during COVID-19

1. Gender: Male Female

2. Academic achievement level

Relatively high (upper; <30%) About average (middle; 30%–70%)

Relatively low (lower; >70%)

3. Indicate your non-face-to-face theory classes satisfaction.

	1	2	3	4	5	
Very dissatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

4. Indicate your face-to-face laboratory classes satisfaction.

	1	2	3	4	5	
Very dissatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

5. Indicate your self-directed learning level.

	1	2	3	4	5	
Very poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very good