Complex motivations of Japanese medical students to an online medical English course during the COVID-19 pandemic
[version 1; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: In response to globalism, many East-Asian countries now include a Medical English course in their undergraduate medical education syllabus. The purpose of this study was to explore the relationship between the related attribute factors of students' motivation to learn medical English through an online modality.

Methods: Of 134 eligible fourth-year medical students who participated in an Online Medical English course at a Japanese medical school, 105 were enrolled in this single cohort study. The participants completed pre- and post-course surveys regarding their motivation during the course, including perceived academic control and task value, and their assignment scores. A structural equation model was used to examine the hypothesized relationship of constructs, based on control-value theory.

Results: The model showed a good fit for the data ($\chi^2$/df=7) = 1.821, p=0.969, CFI = 1.000, RMSEA < 0.001, SRMR < 0.05, GFI = 0.993, AGFI = 0.980). The latent variables of the perceived course achievement related to the observed variables of academic control and task value scale scores, and negatively predicted willingness for self-study after course completion. In addition, the preference of English as the course language negatively predicted willingness for self-study of medical English.

Conclusion: Choice of English as the language of instruction and perceived high course achievement negatively predicted students' motivation for further English self-study after the class. The importance of incorporating the perspective of lifelong learning into the teaching of medical English was recognized.
Keywords
Medical English, medical students, motivation, predictors, performance

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Author roles: Azuma M: Data Curation, Formal Analysis, Writing – Original Draft Preparation, Writing – Review & Editing; Nomura O: Conceptualization, Investigation, Methodology, Project Administration, Validation, Writing – Original Draft Preparation, Writing – Review & Editing; Sakuma T: Data Curation, Formal Analysis, Writing – Review & Editing; Soma Y: Data Curation, Formal Analysis, Investigation, Supervision, Validation, Writing – Original Draft Preparation, Writing – Review & Editing

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**Introduction**

Globalization has become a strong force affecting healthcare and education in the health professions worldwide. Health professions education is now an international enterprise due to the globalization of healthcare delivery, with increasing collaboration between medical schools and hospitals in different countries. Increasing movement of individuals between countries for business and tourism purposes now requires health professionals even in non-English speaking countries to communicate with foreign patients in English. In some non-English-speaking countries, English has emerged as the medium of instruction for teaching medical education subjects. Furthermore, the global response to the COVID-19 pandemic has highlighted the use of English as the essential “international language” by health professionals and biomedical researchers, and the use of English has enabled prompt dissemination and gathering of medical research findings that have saved patients’ lives.

Accordingly, a medical English course is now included in the curriculum of health professions education in East-Asian countries, including Japan, Korea, and China. However, traditional educational culture is a potential barrier for teaching and learning medical English in these countries. In East Asia, Confucianism is the fundamental value in the teaching and learning community, and the educational culture reflects the Confucian ideals of filial piety, loyalty to state, submission to authority, and social order; thus, the traditional modality of teaching is a didactic lecture in which students are expected to listen quietly. Although didactic lectures can effectively provide students with medical knowledge, this teaching method is less effective in learning English for communication purposes and has the effect of decreasing students’ motivation. Furthermore, large-scale teaching makes it difficult for instructors to give students feedback and to create classroom interactions between students and instructors.

Online technology-based learning has been recognized as an effective instructional strategy for teaching medical English in the East Asian medical education context as it is a rich modality of communication that enhances student-centeredness. Students can initiate learning modules at a convenient time and place, and watch videos of lectures recorded by the instructors, which promotes student-centered and self-regulated learning. The students submit their assignments via an online platform according to the deadline, and instructors can grade the assignments and provide individualized feedback even when the students number more than 100. This system can foster teacher–learner interactions and facilitate student motivation, and it is also a powerful solution for issues associated with educational delivery in the COVID-19 pandemic era. The student–teacher interaction can be maintained via the online platform even when the participants are socially and physically distant.

To maximize the effectiveness of online medical education courses, it is vital to explore attribute factors of the course such as students’ motivation and the instructor’s feedback to the students. By identifying the attributes of successful medical English courses, the program faculty can improve the course structure and promote students’ self-regulated learning of medical English. Therefore, this study aimed to explore the relationship of related attribute factors of students’ motivation to learn medical English via an online modality.

**Methods**

**Educational context**

This study was conducted at Hirosaki University in Japan. An Online Medical English course was provided for fourth-year medical students from July to August in 2020. The course consisted of three modules: (1) cultural diversity, (2) sending emails in English, and (3) delivering an elevator pitch. In each module, the students were required to watch a 30-minute instructional video, complete the assigned task for each topic, and submit the assignment. Classes were delivered in the Japanese language based on the students’ responses to a pre-class survey regarding the preferred course language.

**Study design and participants**

The Online Medical Education database of our university was utilized in this single cohort study. Of the 134 eligible fourth-year medical students at our medical school, 29 were excluded due to missing data, and 105 students were enrolled (Figure 1).

**Data collection**

The database included pre- and post-course surveys regarding motivation on the course, as well as the assignment scores. We first conducted a pre-course survey that asked whether the students preferred the classes to be delivered in English or Japanese on the day of the first module in July 2020. The assignments for the first two modules were graded by the instructor based on a predefined grading rubric. The post-survey, conducted on the day of the last module in August 2020, included items for measurement of perceived academic control and task value, and asked whether the students wanted to undertake further self-study in medical English using extra-curricular materials. Academic control was assessed using the five items in the Japanese version of the Academic Control Scale to measure their cognitive appraisal of control-toward-performance. The perceived value of the task was assessed using the six items in the Japanese version of the Motivated Strategies for Learning Questionnaire. A copy of the pre- and post-course surveys can be found in the Extended data.

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**Figure 1. Flow chart of participant selection.**

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Excluded: missing data (n = 29)

Fourth medical students taking Online Medical English Course (n = 134)

105 students were analyzed in this study
Theoretical framework
We applied Pekrun’s control-value theory as the theoretical framework for the analysis. This theory postulates that the learners’ perceptions of control and value are predictors of the learners’ academic achievement\textsuperscript{16,17}. Accordingly, we hypothesized a circulatory relationship among the variables of language delivery in the course, performance in class, efficacy in the English class, and willingness to undertake self-study after completion of the course. In other words, that students who prefer English as the course language score higher in the assignment, their score performance predicts higher scores of academic control and task value in the post-course survey (class efficacy), and class efficacy promotes students’ motivation to undertake self-study after completion of the class (Figure 2).

Statistical analysis
We conducted univariate statistical analyses from two aspects of comparison: (1) preferred course language (Table 2) and (2) willingness towards self-study of medical English after course completion (Table 3). Wilcoxon rank sum test or chi-square test was performed for the analyses, as appropriate. A structural equation model was used to examine the hypothesized relationship of the constructs, based on control-value theory (Figure 3). The goodness of fit of the model was determined by examining the following: comparative fit index (CFI), root-mean-square error of approximation (RMSEA), standardized root-mean-squared residual (SRMR), goodness of fit index (GFI), and adjusted goodness of fit index (AGFI). All statistical analyses were conducted using the R software (version 4.1.0), and lavaan (version 0.6-8), semPlot (version 1.1.2), and semTools (version 0.5-4) packages.

Ethics
The written informed consent of the study participants was waived, and the informed consent was obtained on an opt-out basis. This consent process was reviewed by the Ethics Committee of the Hirosaki University Graduate School of Medicine. The Ethics Committee of the university waived the ethics approval process as this study is not an interventional study involving patients but an educational observational study whose participants were medical students (Decision date: January 8\textsuperscript{th}, 2021).

Results
Univariate analysis
Table 1 summarizes the descriptive statistics of the measured variables. Students who preferred English as the course

![Figure 2. Hypothesis of the relationship of the constructs.](image-url)

Table 1. Characteristics of participants.

|                          | n = 105 |
|--------------------------|---------|
| Preferred English as the course language | 41 (39.0) |
| Score of cultural diversity assignment | 17 (15–20) |
| Score of sending English emails assignment | 32 (30–36) |
| Academic control scale score | 4.0 (3.6–4.2) |
| Perceived value of the task score | 5.5 (4.9–6.0) |
| Willingness for self-study of medical English | 42 (40.0) |

Note. Values are the median (25th–75th percentile) or n (percentage). Analysis was performed by Wilcoxon rank sum test or chi-square test, as appropriate.

Table 2. Comparison of variables according to preference of course language.

|                             | Preferred English n = 41 | Preferred Japanese n = 64 | p-value |
|-----------------------------|--------------------------|---------------------------|---------|
| Score of cultural diversity assignment | 20 (16–20) | 16 (15–19) | 0.004 |
| Score of sending English emails assignment | 32 (32–36) | 32 (30–32.5) | 0.154 |
| Academic control scale score | 4.0 (3.4–4.2) | 4.0 (3.6–4.2) | 0.589 |
| Task value scale score | 5.5 (5.0–6.0) | 5.5 (4.8–6.0) | 0.461 |
| Willingness for self-study of medical English | 8 (19.5) | 34 (53.1) | < 0.001 |

Note. Values are the median (25th–75th percentile) or n (percentage). Analysis was performed by Wilcoxon rank sum test or chi-square test, as appropriate.
language scored higher in the cultural diversity assignment. There was no significant difference in score in the assignment on sending English emails, or in scores for academic control or task value, in terms of choice of course language (Table 2). The percentage of students willing to study medical English after completion of the course was significantly lower in students who preferred English as the course language than in those who preferred Japanese (Table 3).

### Table 3. Comparison of variables according to willingness to study English after the course.

|                                | Willing n = 42 | Unwilling n = 63 | p-value |
|--------------------------------|----------------|------------------|---------|
| Preferred English as the course language | 8 (19.0)       | 33 (52.4)        | < 0.001 |
| Score of cultural diversity assignment | 16 (15–20)  | 17 (15–20)       | 0.414   |
| Score of sending English emails assignment | 32 (30–32)   | 32 (32–36)       | 0.146   |
| Academic control scale score | 3.8 (3.3–4.0) | 4.0 (3.8–4.2)    | 0.004   |
| Perceived value of the task score | 5.2 (4.6–5.7) | 5.6 (5.0–6.1)    | 0.003   |

Note. Values are the median (25th–75th percentile) or n (percentage). Analysis was performed by Wilcoxon rank sum test or chi-square test, as appropriate.

### Structural equation modeling

The model showed a good fit for the data ($\chi^2$[df=7] = 1.821, p=0.969; CFI = 1.000, RMSEA < 0.001, SRMR < 0.05, GFI = 0.993, AGFI = 0.980). The latent variable of course performance was related to the observed variables of assignment scores, and the preference of English as the course language positively predicted the course performance. The latent variables of the perceived course achievement related to the observed variables of academic control and task value scale scores, and negatively predicted willingness for self-study after the course completion. In addition, the preference of English as the course language negatively predicted willingness for self-study in medical English (Figure 3).

### Discussion

This study explored the attributive factors of students’ motivation to learn medical English via an online modality. We found that students’ choice of English as the language of instruction and perceived course achievement were negative predictors of their motivation for English self-study after the class. Although we hypothesized a circulatory relationship among the variables of language for course delivery, performance in class, efficacy of English class, and willingness for further self-study, based on control-value theory, the observed results were contrary to the hypothesis.

Considering that choosing English as the course language was positively related to course performance, the reason for the negative relationship between the course language choice and willingness for self-study could be explained by self-satisfaction.

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**Figure 3. Structural model results.** Fit indices: $\chi^2 = 1.821$ (df = 7, p = 0.969), CFI = 1.000, RMSEA < 0.001, SRMR < 0.05, GFI = 0.993, AGFI = 0.980, *p*-value < 0.05.
with course performance in highly performing students. These students might have been aware of their achievement in class based on their returned assignment grades, and concluded that it was unnecessary for them to undertake further study of medical English. Furthermore, the negative relationship between perceived course achievement (i.e., latent variable of the observed variables of academic control and task value scale scores) and the desire for future self-study may be interpreted as the impact of students’ self-satisfaction.

Another reason for the low motivation for self-study among those who chose English as the language of instruction might be that they want to complete their English learning in the classroom. They may feel that they are too busy to study on their own, and that self-study does not influence their grades. Presumably, those who chose English were not motivated to undertake self-study after the classes were conducted in Japanese.

Another possible reason for these results could be that the students preferred a collaborative face-to-face environment for learning medical English rather than individualized self-study. It is also important to note that the uncertainty and rapid changes caused by the COVID-19 pandemic have caused significant psychological distress among students, and medical students are exhausted by online learning.

The contradictory results of this study are explainable by Heckhausen’s action-phase model of developmental regulation. The theory suggests that individuals optimize their behaviors for goal engagement depending on the urgency of the goal to be achieved. For Japanese medical students, learning medical English may not be an urgent goal, and they prioritize the acquisition of medical knowledge and skills. The learning of medical English by medical students may be best facilitated by effective embedding within the long-term lifelong learning framework.

Limitations
The results of this study were based on short-term investigations of medical students’ motivational briefs and course performance; however, it is essential to obtain longitudinal observations because language acquisition is a life-long learning process.

Conclusion
We observed that Japanese medical students have complex values regarding learning medical English. The importance of incorporating the perspective of lifelong learning into the teaching of medical English was recognized.

Data availability
Underlying data
The raw data of this study are stored securely in the computer of the principal investigator of the article. The data cannot be made publicly available due to the security consideration reviewed by the IRB (ethical approval waived, decision date: January 8th, 2021). However, the raw data will be shared on reasonable request to the corresponding author (email: nomura_o@hirosaki-u.ac.jp) under conditions where the data provision is highly likely to develop medical education research and where the data can be secured in strict confidence.

Extended data
Open Science Framework: Motivations of Japanese medical students to online medical English course. https://www.doi.org/10.17605/OSF.IO/PXD2U

This project contains the following extended data
- A copy of the pre-course survey
- A copy of the post-course survey

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication).

Acknowledgements
The authors wish to thank all students who participated in this survey and Ms. Rumiko Narita for her assistance with data management.

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Open Peer Review

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Version 1

Reviewer Report 20 September 2022

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Yasushi Matsuyama
Medical Education Center, Jichi Medical University, Shimotsuke, Japan

The data are appropriately validated and presented. I believe that this paper deserves to be indexed after minor revision.

As for the minor revision, the authors should explain the details of the educational program based on educational theory in order for readers to generalize this research data and apply it to their education practice.

#1:
In the introduction part, the authors explain the potential of online technology-based learning to enhance individual feedback and active teacher-student interactions in English language education in East Asia. I agree that individual feedback and active teacher-student interaction are key to student-centered and outcome-based education.

However, the statement "students can initiate learning modules at a convenient time and place, and watch videos of lectures by the instructors, which promotes student-centered and self-regulated learning" may mislead readers.

Simply providing modules and on-demand videos for learning at any location and at any time is not student-centered education nor does it promote self-regulated learning. I think this part is a problem with the way the text is written, and I would appreciate it if the authors could revise it.

#2:
In the various modalities of this online program, individualized feedback and active interaction between teachers and students online will motivate active learning. This could be the theory underlying the authors’ educational practice.

In other words, simply preparing on-demand materials, requesting students to submit a report, and providing one-time individual feedback on the submitted report is not an educational practice that takes advantages of online technology as explained in the introduction.

For this reason, in the educational context of the Methods section, I would like the authors to show how teachers and students were interactive through various modalities in the online learning course consisting of three modules. Specifically, I would like the authors to describe the following:
1. What methods did students use to communicate with teachers when they wanted to ask questions after watching the on-demand videos? And how often did they have communication with teachers?

2. What sort of learning tasks were given to students after they watched the video? Perhaps not just submitting a report, but what else did the students do?

3. When working on the assignment, can students ask questions to teachers in an online dialogue as needed?

4. How long did it take before students received feedback after submitting the assignment?

5. Did the authors try to improve the quality of teachers’ feedback in order to enhance students’ motivation?

6. After students received feedback, were they allowed to engage in continuous online interactions with faculty members?

7. Also, in terms of the impact of grading methods on student learning behavior, please indicate the level of stakes in the grading of the assignments submitted for this class.

#3:
In the Discussion or Limitations, I would also like to see how much the distinctive learning module itself, as indicated in #2, may have affected the motivation of the learners. Could there have been insufficient student/faculty interaction in some respects?

**Is the work clearly and accurately presented and does it cite the current literature?**  
Yes

**Is the study design appropriate and is the work technically sound?**  
Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**  
Partly

**If applicable, is the statistical analysis and its interpretation appropriate?**  
Yes

**Have any limitations of the research been acknowledged?**  
Partly

**Are all the source data underlying the results available to ensure full reproducibility?**  
Yes

**Are the conclusions drawn adequately supported by the results?**  
Yes

**Competing Interests:** No competing interests were disclosed.
**Reviewer Expertise:** Medical Education. Self-regulated learning. Assessment.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 01 Mar 2023

Osamu Nomura

Thank you for the time and effort you have dedicated to providing insightful feedback, which has enabled us to strengthen our manuscript. We have revised the manuscript in response to the detailed suggestions and now wish to resubmit the paper for further consideration. We provide our revisions and changes in the point-by-point response below, and trust that these satisfactorily address all issues and concerns raised in your letter dated 20 Sep 2022.

Comment #1: Thank you for indicating this point. Accordingly, we have included a more detailed explanation in the Introduction (page 4, para 3) as follows. Students can initiate learning modules at a convenient time and place, watch videos of lectures recorded by the instructors, and ask questions online, which promotes student-centered and self-regulated learning.

Comment #2: Response: Thank you very much for this important comment. In response, we have provided detailed explanations of each point in the Methods (page 4, Educational context) as follows. The first module consisted of reading an essay and submitting a reaction paper to it. Students were instructed to use skills taught in previous lectures and write 200–300 words. The second module consisted of writing an email to the person in charge of a desired study abroad destination. Three settings were presented to enable students to imagine and write in concrete terms. The third module was conducted in the second setting and comprised the following steps: (1) write a script for an elevator pitch, (2) practice, (3) record, (4) listen to the recording and perform a self-evaluation, and (5) complete a reflection sheet based on the self-evaluation.

The course materials were presented to the students to help them prepare for the next assignment. Because the submission requirements of the online course differed from the usual method, the students watched a video that explained how to submit their assignments smoothly (description of the e-learning platform and video submission). Communication with the students was by email, with the option of asking questions online; however, there were no instances of online conversations. Considering the loss of motivation over time, students who asked questions via email were responded to as soon as possible (within 24 hours at the latest).

Feedback was provided within one week. Concise and specific feedback was provided promptly. Communication about feedback was by email, also with the option of asking questions online if necessary. All grading items for each assignment were clearly explained in each video and students’ submissions were graded accordingly.

Comment #3:

We consider that the extent to which the distinctive learning module itself affected the
motivation of the learners has not yet been fully explored. We have acknowledged this point in the Discussion as follows (page 10, para 4). The online lecture and online submission of assignments allowed students to receive feedback immediately after submitting their assignments, which we believe led to a strong sense of interaction. We believe the interaction was facilitated by allowing students to watch the lecture and ask questions at a time of their choosing, whereas in a face-to-face class they would have to wait in line after class to do so, in the 10-minute window before their next class. We believe that this arrangement had a positive impact on their motivation in the second and subsequent lectures. However, due to the nature of the online course, the method of submitting assignments was unusual (description in the e-learning platform and video submission) and may have been stressful for the students. Again, thank you for giving us the opportunity to strengthen our manuscript in response to your valuable comments.

**Competing Interests:** No competing interests were disclosed.

Reviewer Report 21 April 2022

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Maria Clelia Zurlo

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The study aims to explore the relationship between Japanese medical students' motivations (including perceived academic control and task value) and assignment scores related to attending a course to learn medical English through an online modality.

A structural equation model based on control value theory was used to examine the hypothesized relationship between the constructs. The study is interesting and useful. The methodology adopted for the data analysis is adequate.

I have only two suggestions:

1. The purpose of the study must be better explained in the abstract.

2. In my opinion, the potential effects of the online modality of the course for learning medical English are not adequately explored. I suggest that the authors describe their potential influence on the results and/or introduce these aspects in the section containing limitations and future research.

**Is the work clearly and accurately presented and does it cite the current literature?**
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Have any limitations of the research been acknowledged?
No

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Perceived stress, motivations, psychological health conditions of university students

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 01 Mar 2023

Osamu Nomura

Thank you for the time and effort you have dedicated to providing insightful feedback, which has enabled us to strengthen our manuscript. We have revised the manuscript in response to the detailed suggestions and now wish to resubmit the paper for further consideration. We provide our revisions and changes in the point-by-point response below, and trust that these satisfactorily address all issues and concerns raised in your letter dated 21 Apr 2022.

Comment 1 Response: Thank you for pointing out this deficiency. In response, we have explained the purpose of the study in the Abstract in more detail (page 3, Background) as follows.

Comment 2 Response: Thank you for mentioning this point. We have added the following to the Discussion section (page 10, para 4), as suggested. The results suggest that characteristics of the online course, such as instructor grading (interaction) and the freedom to take the course and submit assignments at any time, increased students’
academic control and task value. The finding that students with high efficacy and those who chose English as their language of instruction did not want to further self-study with the course materials suggests that they tend to value the interaction of the online course, rather than their skill development. Again, thank you for giving us the opportunity to strengthen our manuscript in response to your valuable comments. We trust that the revisions are satisfactory and that the manuscript is now suitable for publication in your journal.

**Competing Interests:** No competing interests were disclosed.