

## Original Article

# Evaluation of simulation learning materials use to fill the gap in Japanese dental English education

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Even though English is most frequently the common language when the patient's native language differs from that of a dentist, the opportunities for Japanese undergraduate dental students to learn dental English are now quite limited. The purposes of our study were to investigate: the effectiveness and feasibility of the computer-assisted simulation materials as one solution strategy for dental English education in Japan, and the needs and demands for dental English from the learners' side. Interactive simulation materials for medical interviews in English and clinical cases which were translated to English, were delivered via Learning Management System (LMS) to nineteen trainee residents of dentistry (residents). Evaluation for the materials, learners' knowledge and interests in the contents, and ease of operation were obtained by post-questionnaire (response rates were 100% and 95%, respectively). Both questionnaire-surveys received positive feedback toward the materials, yet 47% answered that they lacked the level of

knowledge about contents of the medical interview in English. Results were sufficient to suggest that the residents would like to have the opportunity to study or practice medical interview in English, or English related to dentistry, and that the simulation materials could be one of the solution strategies for opportunity provision.

**Key Words:** Dental Education, Dental English, Multimedia, Teaching Materials, Computer-Assisted Instruction.

## Introduction

English is necessary in various circumstances for healthcare professionals to perform treatments, obtain knowledge, and communicate with colleagues or patients. When the patient's native language differs from that of a dentist, English is most frequently the common language. However, the opportunities for Japanese undergraduate dental students to learn dental English (which includes the skills to use English in clinical settings) or English related to dentistry are now quite limited.

In 1999, Morse *et al.* conducted a comprehensive questionnaire-survey on English education at all twenty-nine Japanese dental schools<sup>1</sup>. According to the paper, it was revealed that even though all educators considered English was necessary for dental students, almost all

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the dental schools lacked educators who were native or native-level speakers and most of these did not have a health science background. In addition, there were few textbooks available for English in dentistry and no ideal textbook designed for Japanese dental students to study English<sup>1</sup>.

About 10 years later, in March 2011, Rodis *et al.* conducted a survey on "dental English" courses<sup>2</sup>. In the survey, they differentiated dental English courses from general English courses and questioned whether dental schools in Japan provided dental English courses to their students or not. Twenty-two out of twenty-nine schools provided a dental English course, yet the terms and styles differed<sup>2</sup>. Many years passed since the survey of 1999, however, only very few used textbooks made especially for dental students, and the problems reported in 1999 still existed<sup>2</sup>. Even though the importance of English is apparent, both studies noted that little research attention was addressed to the field of dental English education in Japan<sup>1, 2</sup>.

As the above two studies focused on the situation and opinions from the institutional side, our study focused on that of the student / learners' side, conducting a survey and collecting opinions from relatively new graduates of dental schools who are currently receiving post-graduate dental clinical training at a dental hospital, by using our five computer-assisted simulation materials, in which three were from interactive materials for English as a Second Language (ESL) dentists on medical interviews<sup>3</sup> and two clinical case simulation materials<sup>4</sup> all translated to English. Tokyo Medical and Dental University (TMDU) has been developing clinical simulation materials for undergraduate students with an authoring tool (SIMTOOL) since 2003, with the environment of the decreased number of patients in student clinic and the limited number of clinical cases that students can experience in their education. These show similar points we can observe in dental English education in Japan: limited experiences and / or time for learning dental English.

The purposes of our study were to investigate: 1) the effectiveness and feasibility of the computer-assisted simulation materials as one solution strategy for dental English education in Japanese dental schools and 2) the needs and demands for dental English from the learners' side.

## Materials and Methods

This study was approved by the Ethics Committee of Tokyo Medical and Dental University (No.968). In this

study, three interactive simulation materials for medical interviews in English (for ESL dentists)<sup>3</sup> and two clinical case simulation materials<sup>4</sup> which were translated to English were delivered via Learning Management System (LMS; WebClass<sup>®</sup>; DATA PACIFIC (JAPAN) LTD., Japan) to nineteen trainee residents of dentistry (residents) in August, 2014. The residents had graduated from various universities in Japan and were working at Tokyo Medical and Dental University Dental Hospital in their postgraduate clinical training at that point in time. Questionnaires, concerning the learners' knowledge, the usefulness / effectiveness of the materials for learners, learners' interest in the contents, and ease of operation were also administered via LMS after studying the three interactive materials for medical interview, under the titles of 1) 56 yo Female jaw pain; 2) 48 yo Female filling fell out; 3) 25 yo Female black spot, and two clinical case simulation materials, under the titles of 1) 19 yo Female pain and color change; 2) 43 yo Male persistent postoperative pain, respectively. Permission was obtained from all questionnaire participants.

Figures 1 and 2 show screenshots of the simulation materials for learners. The upper half of the screen has three windows, where the learners can have an audio / visual experience of the situation. Oral pictures, x-rays, dental formula, notes, movies or audio sounds can be uploaded to the windows. Under the windows, questions or instructions were shown to guide the learners' experience of the clinical cases. Multiple-choice answers for each question and the number of questions per scenario can be varied according to the necessary steps clinicians should conduct in each case, so that the learners can proceed with step-by-step decision making throughout the materials<sup>5-10</sup>. After selecting and confirming their choice, the answer and explanatory notes for the choice are displayed. The explanatory notes were written in Japanese for the medical interview series, but for the clinical case materials, even explanatory notes were written in English.

The quality of all materials were certified by the two-step reviewing system<sup>5-7</sup>.

### Interactive materials for medical interview in English (Figure 1)

In the materials for medical interview in English, learners can experience scenarios in which they have a patient who only speaks English<sup>3</sup>. In this series, learners can study medical interview skills in English as well as communication skills in English, which explains why this series has the title "for ESL dentists". As is the case

The screenshot shows the 'Health Questionnaire' interface in TMDU SimProc. A red box highlights the questionnaire text, which includes questions about dental visits, medical history, and surgery. A callout box with an arrow pointing to the play button says 'Click the play button, and choose the best answer.' Below the questionnaire, a multiple-choice selection area shows options A, B, and C, with A selected. A callout box below this area says 'No notations for the multiple-choice answers.' To the right, a diagram shows three overlapping windows labeled A, B, and C, with an arrow pointing from window A to window C. A callout box below this diagram says 'Listening (A→C) Audio experience of the situation.'

The screenshot shows the 'Answer' screen in TMDU SimProc. A red box highlights the play button area with a callout box saying 'Click the play button, and choose the best answer.' Below the play button, a callout box says 'Reviewing the audio with the explanation is possible.' At the bottom, a box labeled 'Answer' contains the text: 'The alternative "A" was chosen inappropriate.' and 'The alternative "B" was not chosen. 最初に問診票にある主訴について詳しく聞きます。 A: I understand you have a toothache, which tooth? 問診票に痛みについては書かれていません。 B: When did your filling fall out? Does it hurt? いつ脱落したか、痛みがあるかを聞きます。 C: Could you open your mouth, please? 口の中を診るのはもう少し後です。 [Your current score 0 points]'. A callout box to the right of this area says 'After selection and confirmation of choice, the answer and explanatory notes will be displayed. The sentences, written in English, are shown here, with explanatory notes written in Japanese.'

Figure 1. Screenshot examples for interactive materials for medical interview in English; The bottom screenshot example shows the screen after selecting and confirming their choice.

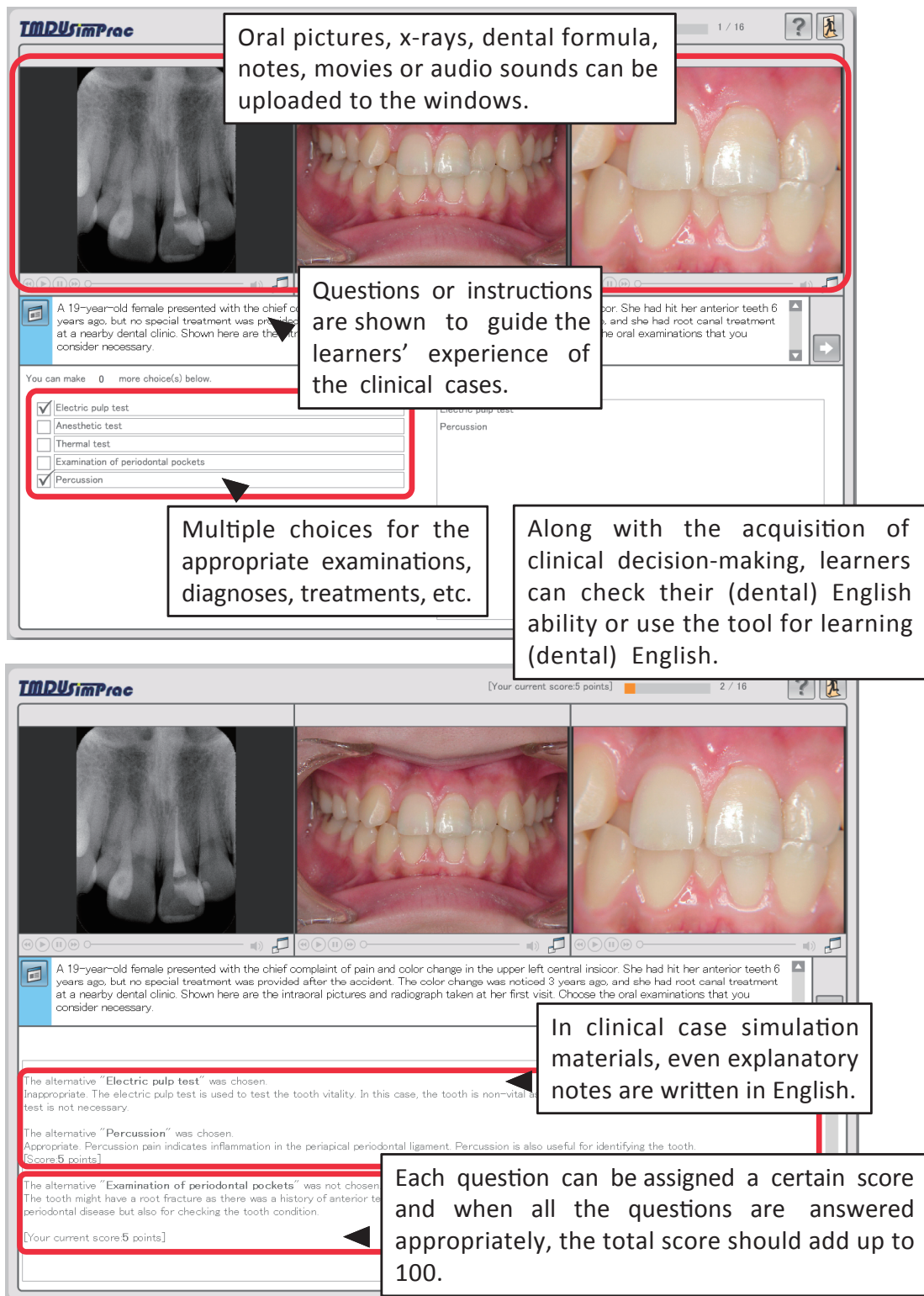


Figure 2. Screenshot examples for clinical case simulation materials; The bottom screenshot example shows the screen after selecting and confirming their choice. Even the explanatory notes are written in English.

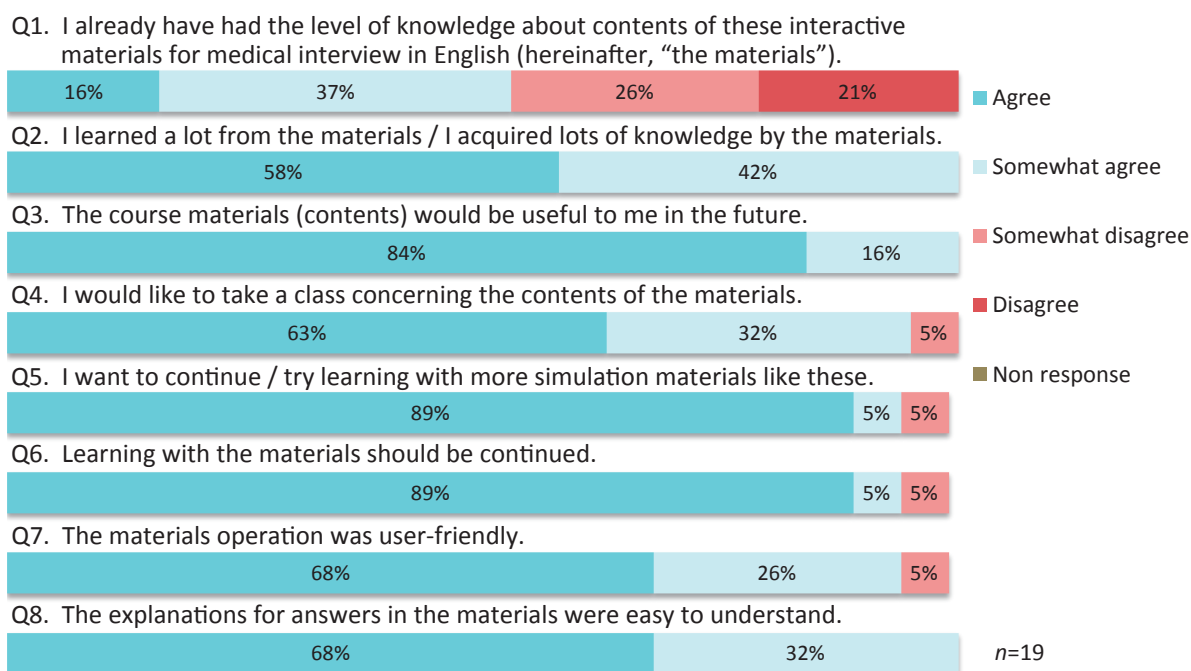


Figure 3. The results of questions 1-8 in interactive materials for medical interview in English (n=19)

\*Original questionnaire was written in Japanese.

with most clinical cases, there are no notations for the multiple-choice answers, they are blank, and learners need to listen to the conversation between the patient and dentist, subsequently choosing the appropriate questions or explanations at each step. The possible answers, written in English, are shown in the explanatory note section after making a selection.

### Clinical case simulation materials (Figure 2)

Clinical case simulation materials were originally developed in Japanese<sup>4</sup>, and learners can experience clinical cases in which they choose the appropriate examinations, diagnoses and treatments based on the scenarios. In this series, each scenario puts more emphasis on examination and treatment planning after the medical interview. While the medical interview series has cases that are commonly experienced by most dentists, this series includes scenarios that the undergraduate students and young dentists rarely experience in their training. The structure of the materials is as previously mentioned, but this series contains more clinical pictures compared with the medical interview series.

## Results

### Interactive materials for medical interview in English

The mean and median accuracy scores for the three materials were 68, 83, 65 (mean) and 75, 75, 65 (median) respectively. The post-questionnaire was completed by 100% of the participants. Figure 3 shows the results of questions 1-8. Fifty-three percent answered that they would already have had the level of the knowledge about contents of these interactive materials for medical interview in English (hereinafter, "materials"). All residents answered that they acquired a lot of knowledge through the materials (Q2, 100%) and considered the contents would be useful in the future (Q3, 100%). Of them, 95% considered learning with the materials should be continued (Q6). In addition, 95% also wanted to continue / try learning with more simulation materials like these (Q5). Also, taking a class concerning the contents of the materials would be desired by 95% (Q4). The explanations for answers in the materials were easy to understand for all of them (Q8, 100%). Their general comments (Q9) were shown in Table 1.

Table1. General comments for interactive materials for medical interview in English (Q9), categorized into 3 sections

<p><b>“Effectiveness”</b>                  — Very useful to study, as I could study not only dental terminology but also expressions in English.                  — As opportunities for English listening practice are limited, I feel learning with this type of materials actively is very important.</p>	6 other comments.
<p><b>“Material design”</b>                  — Explanatory notes with Japanese translation would be desirable to understand why / where I made mistakes.                  — I would like to be able to listen to A, B, and C separately.</p>	4 other comments.
<p><b>“Material contents”</b>                  — I would like to start studying with shorter sentences.                  — The contents are the same as advanced level of medical interview in Japanese, so some parts were difficult to answer.</p>	
<p>I difficult to categorize comment, 5 no comments.</p>	

\* All sentences were originally written in Japanese and translated into English by the authors.

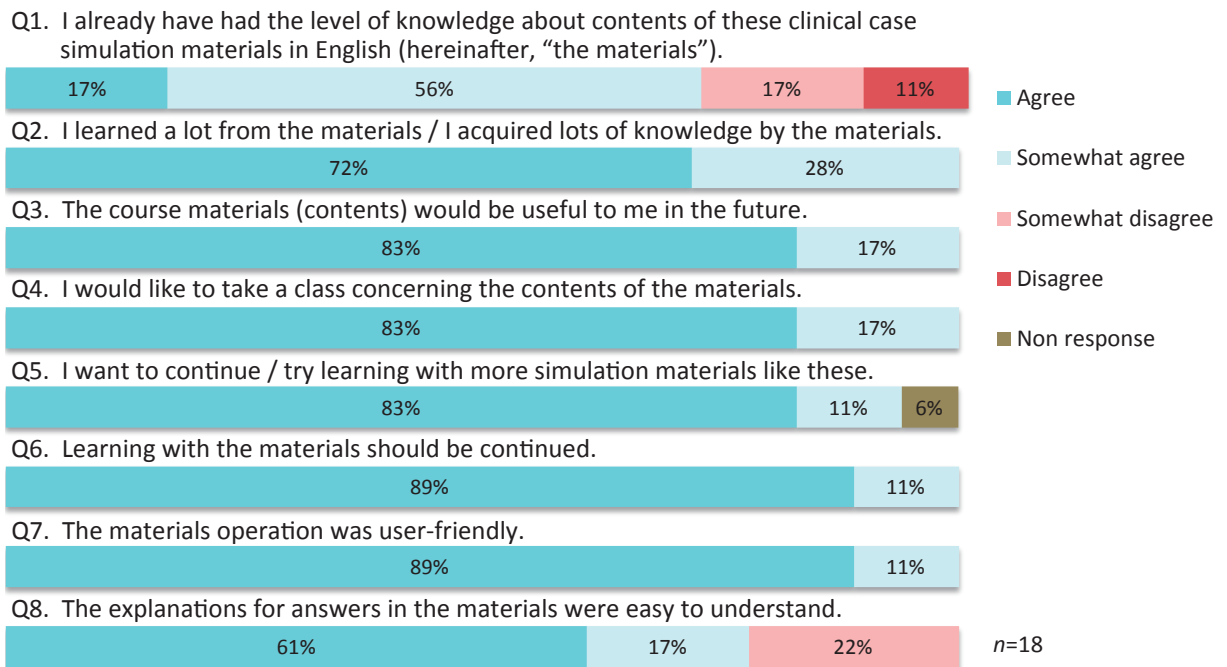


Figure 4. The results of questions 1-8 in clinical case simulation materials (n=18)

\*Original questionnaire was written in Japanese.

**Clinical case simulation materials**

The mean and median accuracy scores for the two materials were 61, 74 (mean) and 65, 70 (median) respectively. Eighteen out of nineteen residents completed the post-questionnaire. The response rate was 95%. As Figure 4 shows, 100% answered positively in Questions 2-4 and 6. Ninety-four percent of them would like to continue / try learning with more simulation materials like these (Q5) and 78% of them considered the explanations for answers in the materials were easy to understand (Q8). Of the participants, 72% answered

that they already have had the level of the knowledge contained in these clinical case simulation materials (Q1). Their general comments (Q9) were shown in Table 2.

**Ease of operation for the materials**

The operation was considered user-friendly for 95% of the participants in the materials for medical interview and responses for the clinical case simulation materials were 100% positive (Q7).

Table 2. General comments for clinical case simulation materials (Q9), categorized into 3 sections

<p><b>“Effectiveness”</b></p> <ul style="list-style-type: none"> <li>— As we were required to not only understand English but also to diagnose and consider the treatment plan, I felt these more difficult than the medical interview materials, but very useful to study.</li> <li>— Good opportunity for me to review my English ability. I would like to continue studying.</li> </ul>	2 other comments.
<p><b>“Material design”</b></p> <ul style="list-style-type: none"> <li>— Japanese explanatory notes are preferred.</li> <li>— There were many terms in English that I didn't know, so it would be preferable to have Japanese translations in explanatory notes. I thought I have to study basic terminology. Thank you.</li> </ul>	3 other comments.
<p><b>“Material contents”</b></p> <ul style="list-style-type: none"> <li>— I would like to study more clinical materials.</li> <li>— The explanatory notes were too simple, so were difficult to understand.</li> </ul>	3 other comments.
5 no comments.	

\* All sentences were originally written in Japanese and translated into English by the authors.

## Discussion

Pointing out problems such as variance of educators and the scarcity of appropriate textbooks for dental students, previous papers<sup>1,2</sup> reported that little research attention had been addressed to dental English education in Japan, even though the importance is apparent. All educators considered that English was necessary for dental students<sup>1</sup>, and this study found favorable opinions from the learners' side with positive feedback for the five computer-assisted simulation materials (Figures 3 and 4).

Clinical skills must be acquired prior to performing clinical treatments, yet room for discussion remains concerning medical interview skills in English or education for English related to dentistry in Japan. In the questionnaire for interactive materials for medical interview in English, 47% answered that they lacked the level of knowledge about contents of the materials. In this study, participants were residents who already had the qualified skills and knowledge in Japanese, which evened out the disparity in knowledge-level of the skill acquisition in each learner and helped us to conclude the cause of scarcity in knowledge might be derived from mainly the subjects' English ability. Also, they preferred the explanations in Japanese and asked for more explanations for terminology (Tables 1 and 2), especially in clinical cases, in which all the explanations were written in English, might be a reason for a certain percentage of participants to consider the explanations were not easy to understand. Therefore, we feel detailed explanatory notes in Japanese should be added in the explanation section as a countermeasure. To conclude this discussion, the objective analyses for current

situations are required, however, the results of this study were strong enough to suggest that the residents would like to have the opportunity to study or practice medical interview in English, or English related to dentistry as both post questionnaire-surveys received positive feedback toward these interactive materials (Figures 3 and 4). This course was not obligatory, which might mean that the participants already had an interest in studying dentistry in English, so that there was a bias toward positive responses for all the questions, while it also indicated that a certain number of graduates would like to study such subjects, yet the opportunity is limited.

Computer-assisted simulation systems in dentistry were validated as beneficial and effective in clinical decision-making<sup>11-13</sup>. Opportunities for practicing symptom understanding, making definitive diagnoses, and treatment planning are important and those skills are required before treating patients. Considering the fact that there is a demand for the opportunity to study dental English, a search for solutions should be conducted immediately in Japan, and these simulation materials could be a strategy to solve this inadequacy.

Residents considered their level of knowledge for medical interview in English was more deficient than that of clinical materials. Although their median scores for all five materials were balanced, which meant that the medical interview materials were not substantially more difficult than that of clinical materials, only one participant selected more positive choices for their knowledge of medical interview materials in Question 1s (data is not shown); that is per se, residents tended to feel more knowledge scarcity in their medical interview skills and the factors for their answers might originate from the lack of acquiring communication skills in

(dental) English in their practical studies. Continuous and professional (dental) English education throughout their six years of study and clinical practice in English in their clinical training would be ideal. However, because of the shortage of human resources to teach and the possible risk of misunderstanding between students and patients in English, simulation learning with virtual patients after they have acquired the competencies in Japanese would be recommended. For Japanese native speakers, medical interviews in English required the integration of English communicative ability and dental knowledge in English. For English communicative ability, baselines acquired before entering university also counted, but university education should cover dental knowledge in English or dental English. However, education for ESL in dentistry seems to still be in the room for improvement phase. This may be due to the difficulty of attaining skilled manpower for teaching, or developing appropriate textbooks for dental education<sup>1,2</sup>, but these computer-assisted simulation materials can provide equal opportunity wherever the learners are located. In this study, the participant number was limited to nineteen, and of course, they did not represent their dental schools' opinions, but the need for dental English might be an issue in all Japanese dental schools as the participants had graduated from various universities yet their opinions were consistent.

The materials used in this study were developed with an authoring tool, named SIMTOOL. Materials developed with SIMTOOL conform to SCORM 1.2 standards and commercially available LMSs can incorporate with them<sup>6</sup>. Though perceptual differences towards Information and Communication Technology (ICT) education in dentistry existed in Japan, the fact that twenty-one out of twenty-nine dental schools implemented ICT before clinical training<sup>14</sup> allows us to mention that providing the simulation materials would be easy and realistically plausible.

Further studies are necessary to evaluate the outcomes derived from this strategy in clinical performance objectively.

### Conclusion

Within the limitations of this study, it was concluded that dental residents, young dentists and students might seek the opportunity to study English related to dentistry or to practice English in clinical scenes, and simulation materials could be one of the solution strategies for providing such an opportunity.

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