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Original Article

Association between gender and self-assessment skills amongst Japanese dental students

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Abstract *Background/purpose:* Self-assessment in dental education is considered a fundamental skill for proficient oral healthcare providers. While previous studies looked at self-assessment in education, few have done so at Japanese institutions. This study aimed to assess potential associations between gender and self-assessment skills in Japanese dental students. *Materials and methods:* Dental students from Niigata University (n = 301) completed preclinical prosthodontic exercises and self-assessed their practical exam performance. Three calibrated faculty evaluated students' work using the same rubric. The difference between student self-assessment score and mean faculty grade was defined as the student-faculty (S-F) gap, indicating how accurately students evaluated their work. The gap scores were stratified by quartiles by faculty grade and by gender. Regression analysis was used to investigate potential associations.

Results: Students mean S-F gap was $2.9 \pm 10.5\%$ with a significant negative association to faculty grades (coefficient, -0.32 ; $P < 0.001$). There was no significant difference between male and female students for faculty grades, self-assessment scores, and S-F gaps. When stratified by quartile, mean S-F gaps of bottom quartile students ($5.7 \pm 11.9\%$) were significantly higher than the rest of the class ($1.9 \pm 9.8\%$; $P = 0.01$), while the mean S-F gaps of students in the top quartile ($-0.8 \pm 10.2\%$) were significantly lower than the rest of the class ($4.2 \pm 10.3\%$; $P < 0.001$).

Conclusion: Niigata University students generally overestimated their performance. Students with higher faculty grades self-assessed themselves more accurately than students with lower

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faculty grades. Gender did not influence S-F gaps, despite dentistry in Japan shifting toward a female-dominated field.

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Introduction

Self-assessment is an important aspect for improving educational outcomes in dentistry, as it can serve as fundamental support in the student's professional training to optimize their learning capacity, encourage responsibility, and guide them towards future self-directed learning.¹ Particularly, this can be an active approach to engage the learner in their self-education. Furthermore, students can be trained to evaluate their work more objectively in order to hold themselves accountable for improving their performance at all stages of their education.² Learning to recognize their weaknesses and proactively striving to enhance themselves can, undoubtedly, be considered one of the most solid pillars for cultivating proficient oral healthcare providers.^{2–4}

Various educational institutions have integrated self-assessment exercises into their education, but there is a scarcity of reports on its outcomes in Japan.^{4–8} Japan is unique in that it is a country with ethnic and sociocultural identity with strong adherence to societal norms.⁹ The dental education program in Japan is structured as a 6-year program that commences directly after high school. This comprehensive training encompasses both didactic and clinical components before students undertake the National Examination for Dentists. Thereafter, they are required to complete a mandatory residency clinical training program that extends for a period of over one year.⁹

Japanese students excel in academics and embody commendable qualities such as consistent diligence, determination, and self-discipline. However, this commendable aspect is also accompanied by substantial pressure to achieve exceptionally high standards.⁹ For this reason, from an academic perspective, self-assessment in Japanese students holds a distinct uniqueness. This may partly be attributable to their cultural differences in gender, self-evaluation, and strong self-criticism.^{4,10,11} In our previous research, we found that when compared to students in the United States, Japanese students had a higher tendency to both underestimate their performance and provide accurate self-assessments more frequently than students in the United States. Conversely, students in the United States were more likely to overestimate their performance when compared to their Japanese counterparts.⁵ The unique nature of the homogeneous cultural backgrounds amongst students and faculty in Japanese dental schools is important to note, and as such, should be taken into consideration when evaluating gender's contributions on student performance and self-assessment.¹²

While dentistry has historically been a primarily male-dominated profession, a recent trend has demonstrated a shift wherein more females are enrolling in dental schools. This evolution in gender distribution may pose an additional

impact on dental education.¹³ As it pertains to self-confidence levels, it has been shown that males are significantly more confident in performing dental procedures, such as a root canal treatment, than females.¹⁴ This finding is further substantiated by another study conducted in the United States (US), which highlights the role of gender in self-assessment capabilities - where male students were found to significantly overestimate themselves compared to their female counterparts.¹⁵

Therefore, recognizing the cultural aspect holds paramount importance in the field of dental education. This recognition serves as the initial step in understanding how cultural traits and gender impact a student's learning approach. It sets the stage for cultivating an environment that not only fosters the acquisition of didactic knowledge and clinical procedures but also enhances self-assessment skills. Due to the limited availability of data on the self-assessment of Japanese students in dentistry, this study aims to evaluate the association between gender and self-assessment skills in the Japanese dental student population.

Materials and methods

This study was approved by the Niigata University Ethics Committee (Protocol #2018–0146). The study sample included 301 dental students at Niigata University from 2017 to 2022 with a participation rate of 100 %. Students completed preclinical formative exercises with faculty assistance and received self-assessment rubrics for reference. At the conclusion of the course, students completed a competency examination where they prepared a left maxillary second premolar for a full metal crown on a typodont model. Self-assessment rubrics were given to students for the exam, and based on their self-evaluation, students were required to score each section to create a self-assessment score. Each section of the self-assessment rubrics is scored on a scale from 1 to 4, with a thorough description for each score. The rubric included 10 sections for a total of 40 points. The student's self-assessment scores were converted to percentages. All identifying information was removed from the self-assessment forms and typodonts.

Three faculty members at Niigata University graded the students' performance with the same rubric used for self-assessment. All grading was blind and independent, and grades were converted to percentages. The overall faculty grade for each student was the mean of their three faculty grades. These faculty graders were also involved in the teaching component of the preclinical course. For faculty calibration, faculty members participated in meetings with the course director to understand how to evaluate formative exercises and the competency examination using the rubrics provided. Faculty calibration was

performed throughout the course and before the competency examination. As such, both students and faculty were familiar with the rubric before the competency examination.

The difference between the students' self-assessment and the overall faculty grade was defined as the student-faculty (S-F) gap score. The S-F gap score was utilized to assess the student's self-assessment skills. A gap score of 0.0 suggests that the student accurately estimated their performance, as the student's self-assessment score and the overall faculty grade were equal. A positive gap score suggests that the student overestimated their performance on the competency examination, while a negative gap score suggests that the student underestimated their performance on the competency examination. The bottom quartile consisted of students with a faculty grade in the lowest 25 % of faculty grades, while the top quartile consisted of students with a faculty grade in the highest 25 % of faculty grades.

Inter-rater reliability was evaluated by calculating intraclass correlation (ICC) using an absolute agreement and consistency two-way mixed-effects model.¹⁶ According to Koo and Li, ICC estimates less than 0.50 suggest poor reliability, estimates between 0.50 and 0.75 suggest moderate reliability, estimates between 0.75 and 0.90 suggest good reliability, and estimates greater than 0.90 suggest excellent reliability. T-tests were utilized to evaluate whether there were significant differences in overall faculty scores, student self-assessment scores, and S-F gaps. Levene's test and the Shapiro-Wilk test were used to evaluate homogeneity of variance and whether the data was normally distributed, respectively. Student's t-test was conducted when samples had equal variances and were normally distributed. Welch's t-test was used when the samples did not have equal variances. Mann-Whitney's U test was utilized when the samples were not normally distributed. Regression analysis was used to investigate the associations between students' faculty grades and self-assessment scores. All analysis was completed using R version 4.1.2 (R Foundation for Statistical Computing, Vienna, Austria). Statistical significance was defined as *P*-value < 0.05.

Results

This study included a total of 301 students (100 % participation rate). Of the 301 students, 123 (41 %) were male and 178 (59 %) were female. The average ICC across the different cohort years for absolute agreement was 0.83 and for consistency was 0.85. This suggests good reliability and proper calibration of the faculty.

The mean faculty grade was 66.1 ± 10.0 %, while the mean student's self-assessment score was 69.0 ± 12.1 % (Table 1). The mean S-F gap was 2.9 ± 10.5 %, suggesting that students generally overestimated their scores compared to the faculty grades. Linear regression was used to assess the relationship between student's self-assessment scores and their faculty grades. The S-F gaps were found to have a significant negative association with faculty grades (coefficient, -0.32 ; 95 % CI, $-0.43, -0.20$; $R^2 = 0.09$; $P < 0.001$) (Fig. 1).

Table 1 Means and standard deviations for faculty grades (%), students' self-assessments (%), and S-F gaps (n = 301).

Faculty grade	Student's self-assessment	S-F gap
66.1 ± 10.0	69.0 ± 12.1	2.9 ± 10.5
S-F gap, student-faculty gap.		

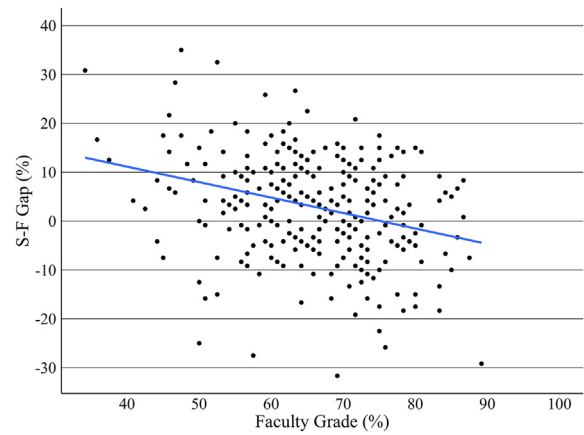


Figure 1 Relationship between faculty grade and S-F gap (Coefficient = -0.32 ; 95 % confidence interval (CI) = $(-0.43, -0.20)$; $R^2 = 0.09$; $P < 0.001$). S-F gap, student-faculty gap.

In addition, students were stratified by gender. There were no statistically significant differences in faculty grades between males (65.7 ± 9.4 %) and females (66.4 ± 10.5 %; $P = 0.607$) (Table 2). There were also no significant differences in self-assessment scores between males (69.1 ± 12.0 %) and females (68.9 ± 12.3 %; $P = 0.585$). Furthermore, no significant differences in S-F gaps were found between males (3.5 ± 10.1 %) and females (2.5 ± 10.8 %; $P = 0.553$).

Students were also stratified into bottom and top quartiles based on their faculty grade. The mean S-F gap for the bottom quartile of students was 5.7 ± 11.9 %, while the mean S-F gap for the top quartile of students was -0.8 ± 10.2 % (Table 3). The mean S-F gap for the bottom quartile was found to be significantly higher than that of the rest of the class (1.9 ± 9.8 %; $P = 0.01$), while the mean S-F gap for the top quartile was found to be significantly lower compared to the rest of the class (4.2 ± 10.3 %; $P < 0.001$) (Table 3).

Table 2 Means and standard deviations for faculty scores (%), self-assessment scores (%), and S-F gaps (%) stratified by gender (male: n = 123; female: n = 178).

Faculty grade		Self-assessment score		S-F gap	
M	F	M	F	M	F
65.7 ± 9.4	66.4 ± 10.5	69.1 ± 12.0	68.9 ± 12.3	3.5 ± 10.1	2.5 ± 10.8
$P = 0.607$		$P = 0.585$		$P = 0.553$	

* *P*-value is significant at < 0.05 .
S-F gap, student-faculty gap.

Table 3 Means and standard deviations for S-F gaps (%) in bottom/top quartiles and the rest of the class.

Bottom quartile vs. rest of the class			Top quartile vs. rest of the class		
Bottom (N = 77)	Rest (N = 224)	<i>P</i> -value	Top (N = 79)	Rest (N = 222)	<i>P</i> -value
5.7 ± 11.9	1.9 ± 9.8	0.01*	-0.8 ± 10.2	4.2 ± 10.3	<0.001*

* *P*-value is significant at <0.05.
S-F gap, student-faculty gap.

Fig. 2 presents histograms showing the distribution of S-F gaps in A) males, B) females, C) the bottom quartile of students, and D) the top quartile of students. Approximately 57.7 % of male students overestimated their performance, 39.0 % underestimated their performance, and 3.3 % accurately estimated their performance. Similarly, roughly 61.2 % of female students overestimated their performance, 36.5 % underestimated their performance, and 2.3 % accurately estimated their performance. A higher percentage of students in the bottom quartile (70.1 %) overestimated their grades compared to the top quartile (49.4 %). In addition, a lower percentage of students in the bottom quartile (27.3 %) underestimated their grades relative to the top quartile (50.6 %). About 2.6 % and 0 % of students accurately estimated their grades in the bottom quartile and top quartile, respectively.

Finally, students were stratified by gender and then each gender was stratified into bottom and top quartiles based on their faculty grade. In the bottom quartiles, males and females did not have statistically different faculty grades, self-assessment scores, or S-F gaps (Table 4). In the top quartiles, males (76.1 ± 4.0 %) had significantly lower faculty grades compared to females (79.1 ± 4.2 %; $P = 0.002$). However, no significant differences were found in self-assessment scores or S-F gaps for the top quartiles of males and females.

Discussion

Our study's findings suggest that students generally tend to overestimate their performance with a higher self-assessment score compared to faculty grades, yet no statistically significant differences were noted between males and females in three domains: faculty grades, self-assessment scores, and S-F gaps. Based on faculty grade, the students in the bottom quartile had a significantly larger S-F gap, whereas those in the top quartile had a significantly lower S-F gap compared to the entire class.

Numerous studies have examined patterns in dental student self-evaluation, identifying potential areas for enhancing the accuracy of their self-assessments.^{4-6,15,17-27} Notably, a correlation was uncovered between a student's academic performance and their self-assessment ability in the preclinical operative dentistry field.^{15,21} These investigations revealed that underperforming students tend to inaccurately evaluate their work and often overrate their performance, while high-performing students tend to be more precise in their self-assessments but often underestimate their own abilities.^{5,6,18,19,21-27} Our study found similar results; a

statistically significant negative association was found between S-F gaps and faculty grades, meaning students with higher faculty grades had lower S-F gaps, and vice versa. This indicates that students with lower faculty grades tended to overestimate their performance, while students with higher faculty grades tended to underestimate their performance or their estimates aligned closer to that of faculty.

As the field of dentistry in Japan moves away from a predominantly male profession, the evolving gender shift has made a substantial impact on current dental education. It has been demonstrated that female Japanese students consistently assigned significantly higher scores to their self-assessments compared to their male peers.⁴ This inclination became more pronounced as the practical training advanced. In correlation, anxiety and confidence were also identified as traits potentially playing a pivotal role in shaping these scores.²⁸ Japanese female students may have outperformed their male counterparts in self-assessment scores due to factors such as increased time dedicated to study and preparation.²⁹ This indicates that female participants exhibited elevated self-assurance, resulting in a distinct propensity to evaluate their self-assessments more positively than their male counterparts. In fact, female students demonstrated proficiency in various interpersonal aspects of medical care.³⁰

However, our study did not show statistically significant differences between males and females regarding faculty grades, self-assessment scores, and S-F gaps. Although these differences were not statistically significant, our findings revealed that male students tended to rate themselves higher than their female counterparts. In particular, male students displayed wider gaps in self-assessment, while female students had lower self-assessment scores. Interestingly, when stratified by gender and quartile, female Japanese students in the top performing quartile had higher self-assessment scores than their male peers. These challenges the results found in our previous studies, in which stratification by gender and quartile saw differences in the bottom quartile as opposed to the top quartile.¹⁵ However, a potential explanation for this finding could be as a result of the composition of students and faculty in Japanese dental schools. Provided they come from more homogeneous and similar backgrounds, cultural influences could shape the contributions that gender has on student performance and self-assessment. Given these insights, future studies with larger sample sizes are encouraged to provide further clarity on these variations.

Japanese dental students tend to display a preference for passive learning, which is a trait influenced by their reserved and cautious demeanor.³¹ This implies that

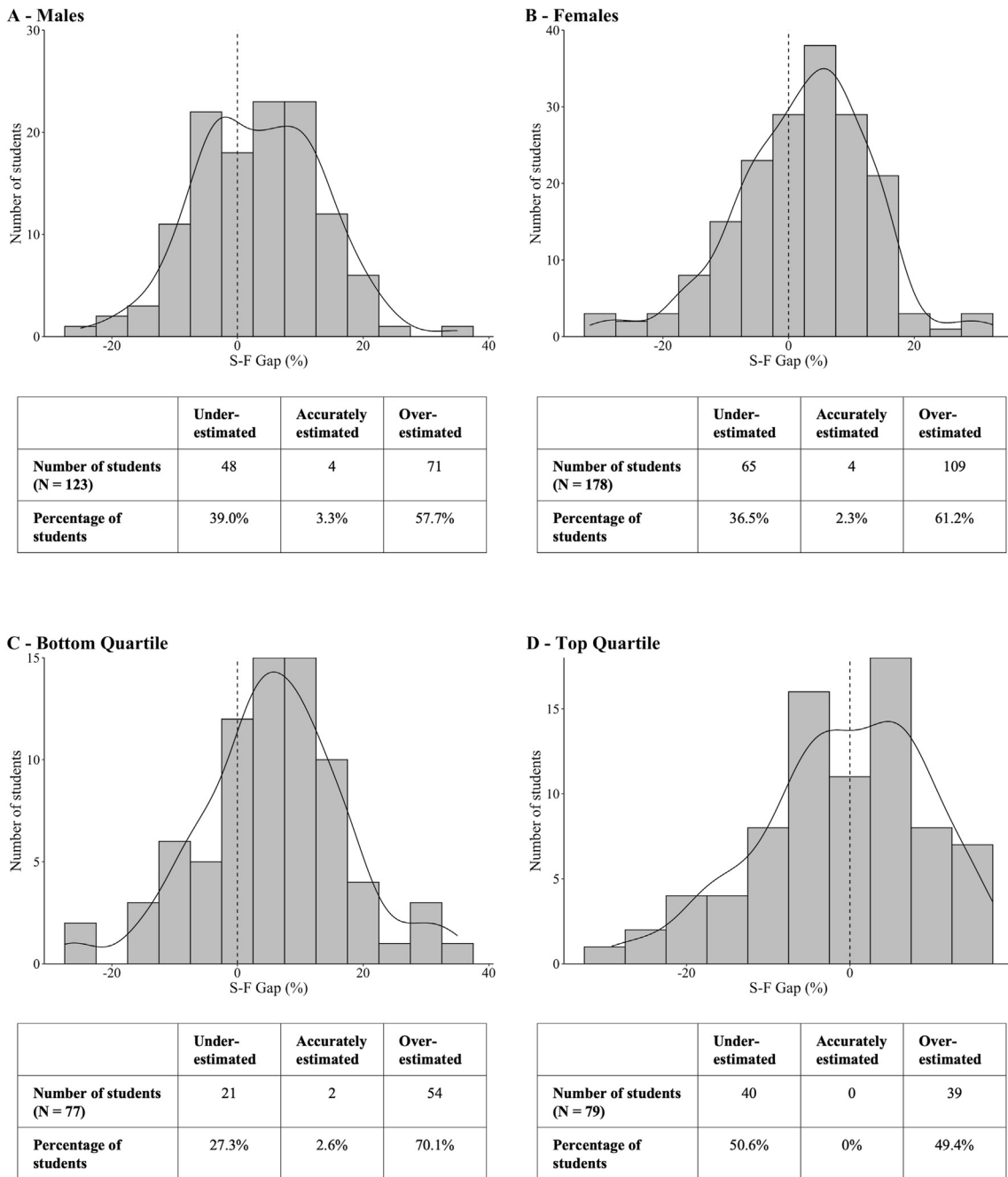


Figure 2 Histograms showing the distribution of S-F gaps in a) male students, b) female students, c) students with a faculty grade in the bottom quartile, and d) students with a faculty grade in the top quartile. Underestimated self-assessments are defined as S-F gaps <0; accurately estimated self-assessments are defined as S-F gaps = 0; overestimated self-assessments are defined as S-F gaps >0. S-F gap, student-faculty gap.

Japanese individuals may be more inclined to exhibit humility or modesty as socially valued characteristics within their cultural context.^{10,11} This aligns with their strong self-critical mindset that stems from a sense of interdependence, group identity, and respect for societal hierarchy and roles.^{10,11} In particular, Japanese people tend to be more receptive to self-relevant critical information as opposed to self-assertive motivations. Rather than investing in discovering their strong attributes, the Japanese students are more motivated to discover their weak

attributes and how to overcome them.^{10,11} Several factors may influence the dental student’s capacity for self-assessment, including preclinical achievement, gender, personality characteristics, cultural influences, and integration of dental technologies.^{6,18–27} Taken together, these factors play a role in shaping a student’s ability to gauge their own progress and skills accurately.

In conclusion, our study found that Japanese students generally overestimated their performance, with a notable negative correlation between students’ performance and

Table 4 Means and standard deviations for faculty scores (%), self-assessment scores (%), and S-F gaps (%) stratified by gender and quartile.

Bottom quartile faculty grade		Top quartile faculty grade		Bottom quartile self-assessment scores		Top quartile self-assessment scores		Bottom quartile S-F gap		Top quartile S-F gap	
M	F	M	F	M	F	M	F	M	F	M	F
53.2	53.5	76.1	79.1	58.4	59.3	75.9	78.1	5.2	5.8	-0.2	-0.9
±6.4	±6.0	±4.0	±4.2	±13.5	±10.6	±9.6	±11.5	±12.7	±11.2	±9.7	±11.3
$P = 0.988$		$P = 0.002^*$		$P = 0.741$		$P = 0.375$		$P = 0.825$		$P = 0.903$	

* P -value is significant at <0.05 .
S-F gap, student-faculty gap.

their self-assessment skills. Interestingly, no statistically significant differences were found between males and females with regards to faculty grades, self-assessment scores, or S-F gaps. Provided that the field of dentistry in Japan is shifting toward a female-dominated field and past studies have attributed gender differences to self-assessment discrepancies amongst students in the United States, it is particularly interesting that gender did not contribute to these differences in the context of Japanese dental students. The unique composition and cultural backgrounds of the students and faculty in Japan suggest that further exploration of the role of culture and gender in the context of self-assessment and student learning may be beneficial.

While these findings offer valuable insights into the dynamics of self-assessment among Japanese dental students, it is important to acknowledge the study's limitations, which include a constrained sample size and a focus on multiple class years within a single institution. Therefore, it is critical to further evaluate the validity of the results by including assessments involving participants from multiple institutions. Future studies including other Japanese dental schools may expand the scope of the sampled population and allow for more generalized trends to the larger Japanese population.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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