



Evaluating the Effectiveness of Periodontal Data Collection Practices in Second-Year Dental Students

Amelia David, BDS, MS; Soh Yeun Kim, DDS; Barnabas Kim, BS; and Hyun Il Kim, BS

ABSTRACT

Background: The objective of this study was to compare the time taken for second-year dental students to collect periodontal data and to assess their confidence level in preclinical activities.

Methods: Second-year dental students at the Loma Linda University School of Dentistry (LLUSD) paired up as clinician and patient and participated in three periodontal data collection preclinical activities. A total of 91 sample data were included. The time that students spent on periodontal data collection was recorded. A presurvey and three postsurveys were conducted to evaluate students' confidence. One sample t-test, the Friedman test, Pairwise comparisons and Kruskal-Wallis tests were used for statistical analysis.

Results: One sample t-test result showed that there was statistically significant time improvement between first and second data collection and between second and third data collection (p -values < 0.001). Results for postsurvey 2 with the Kruskal-Wallis test showed collection times were significantly lower among students who reported confidence in collecting data [$H(1) = 5.60$, $p = .018$].

Conclusions: Statistically significant time improvement through periodontal data collection activities were seen. Students' confidence level and improved data collection time were especially related during the second data collection.

Practical implications: This study signifies that multiple practice sessions in training can be a valuable learning tool to reduce the amount of time that students need to complete the task and increase students' confidence level.

Keywords: Periodontal data collection, preclinical activity, time improvement, students' confidence

AUTHORS

Amelia David, BDS, MS, is an assistant professor and clinical instructor in the department of periodontics at the Loma Linda University School of Dentistry.
Conflict of Interest
Disclosure: None reported.

Soh Yeun Kim, DDS, is an assistant professor and course director of Patient-Centered Care II in the division of general dentistry at the Loma Linda University School of Dentistry.
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Barnabas Kim, BS, is a fourth-year dental student at the Loma Linda University School of Dentistry.
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Hyun Il Kim, BS, is a fourth-year dental student at the Loma Linda University School of Dentistry.
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The goal of the preclinical dental curriculum at the Loma Linda University School of Dentistry (LLUSD) is to ensure students are well-prepared with dental knowledge and skills that will enable them to be competent to practice dentistry effectively and independently in providing patient care. Second-year dental students are trained in preclinical activities that guide their transition from didactic and preclinical settings into direct patient care. Dental students at LLUSD are introduced to periodontics in their first year in a classroom setting and didactic teaching continues in their second year. Preclinical periodontal hands-on practices are emphasized during their second year of dental school along with other preclinical hands-on activities such as patient examination and local anesthesia practice.

Students are paired up and take turns as providers and patients under faculty supervision. Students start actual patient care in the spring quarter of their second year. They perform comprehensive oral evaluations (COEs) and periodic oral evaluations (POEs) under faculty supervision.

In addition to evaluating and assessing their patients for caries and restorative needs, students must be able to evaluate periodontal health by collecting periodontal data during COEs and POEs. Periodontal health is the foundation of overall dental health and also has an impact on patients' general health.¹ Periodontal disease is associated with several medical conditions such as Type 2 diabetes, cardiovascular disease, pregnancy, chronic renal disease, etc.¹ A study showed that treating periodontal disease can increase oral health-related quality of life (OHRQoL).¹ Therefore, it is imperative to understand a patient's periodontal condition, determine accurate periodontal diagnoses and provide appropriate

periodontal treatment for patients. It is important to collect accurate periodontal data to make a correct diagnosis. Dental students must master measuring periodontal pocket depths (PD), bleeding on probing (BOP), clinical attachment level (CAL), gingival recession (GR), mobility and furcation involvement.

There is a need for confirmation on whether repetition of preclinical practice can improve students' confidence and performance in providing patient care. When predoctoral students are introduced to skills they have never encountered before, they are expected to underperform in terms of time management compared to experts. However, the speed and accuracy of data collection is expected to increase after repetition. Wang et al.² conducted research on the surgical skill and confidence level of medical residents by providing repetitive practice during boot camp.² At least five hours of skills training was assigned to the residents, and they were required to train at least 30 hours per month.² They found that repetitive practice is imperative to learning new skills and behavior, and they concluded that repetition improved their confidence levels.²

An integrated review done by Gharibi and Arulappan showed that repeated simulation enhanced self-confidence, critical thinking, knowledge, competence and satisfaction of nursing students.³ Recipients of repetitive simulation reported that their ability to execute certain clinical skills was improved. In addition, they became more active in learning, which was directly linked to increased self-confidence, clinical competence and problem-solving.³ A study from Haleem et al. also showed the importance of repetition in education. Their study recruited a total of 935 adolescents and provided oral health education led by dentists, teachers and peer-leaders.

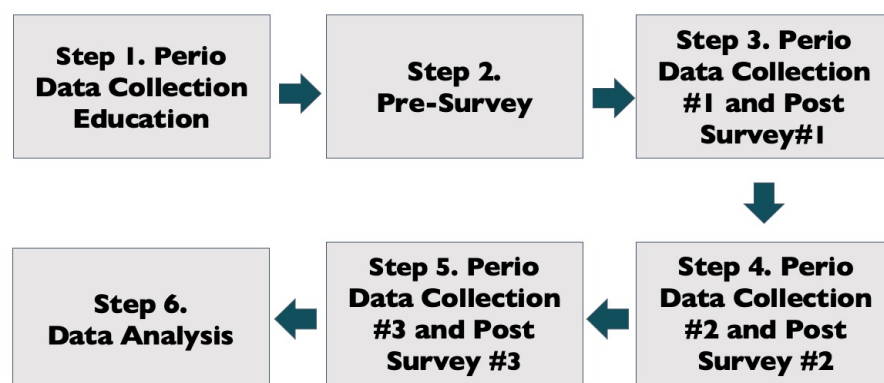


FIGURE 1. Flow chart of experimental design.

probing depth (PD), bleeding on probing (BOP), clinical attachment loss (CAL), gingival recession (GR), mobility and furcation. Techniques on how to accurately measure and collect the data were continuously emphasized.

A total of three periodontal data collection opportunities were given to each student. The first periodontal data collection was in August 2021, the second data collection was completed in October 2021 and the third was in January 2022 during their preclinical sessions in the dental clinic. Each student participated in periodontal data collection both as a clinician and as a patient. For each periodontal data collection activity, student clinicians were randomly assigned to different student patients. Students were instructed to record their data collection start and end times.

The Marquis periodontal probe was used to collect periodontal data. Students measured PD from the gingival margin to the base of the pocket on each of the tooth's six surfaces: distofacial, facial, mesiofacial, distolingual, lingual and mesiolingual.⁹ Bleeding from the pocket was documented as BOP. GR was recorded as the measurement from the cementoenamel junction (CEJ) to the gingival margin.⁹ CAL was measured from the CEJ to the bottom of the pocket. Tooth mobility was checked by using the blunt end of two instruments. Mobility was then recorded according to the extent of the tooth movement.⁹ Furcation involvement was explored in multirooted teeth using the Nabers probe and then graded according to the extent of the furcation.⁹

Student clinicians recorded the amount of time spent to complete each periodontal data collection activity, and the recorded time for each activity was compared and analyzed.

In addition to recording the elapsed time during the periodontal

Regardless of the position of educators, they were able to conclude that repetition and reinforcement can play a vital role in school-based oral health education.⁴

Patients' comfort during a dental procedure is also an important part of patient-centered care.⁵ Research shows that the "level of comfort" a patient perceives during dental care has an impact on the judgment of a dentist's skill and quality of care.⁶ A patient's comfort reflects their trust in the knowledge and experience of the provider. The study also showed that more experienced dentists have higher patient satisfaction levels compared to recent dental graduates, which is associated with their greater skill and speed.⁶ Another study showed that patients appreciate speed, experience and a feeling of ease and comfort when procedures are performed in a timely manner.⁷ Therefore, through repetitive practices, perceived patient comfort is expected to improve as the provider's confidence level and speed in performing periodontal data collection increases.

There were few studies in the literature regarding students' performance and measuring time on periodontal data collection. One study in Japan assessed the time needed to measure periodontal probing on a typodont among dental professionals and dental students.⁸ The study showed that probing time was much longer in the students' group when it was compared to the dental professional group,

but the probing time decreased as they repeated the practice on the model.⁸

The objective of this study was to compare the time taken for novice second-year dental students to collect periodontal data and to assess their self-confidence levels through repeated practice of periodontal data collection during preclinical hands-on sessions. In a survey, student clinicians were also asked which component of the periodontal data collection was the most difficult or challenging to measure.

We hypothesized that repetitive practice of preclinical data collection will lead to second-year dental students being more efficient with periodontal examinations, thus leading to decreased time and increased confidence.

Materials and Methods

The study protocol was reviewed by the Loma Linda University Institutional Review Board (IRB), and the study is exempt from IRB (IRB# 5210456).

A total of 91 dental students from the DDS class of 2024 participated in three periodontal data collection activities (eight dental hygiene graduate dental students were excluded). These 91 students did not have prior periodontal data collection experience.

All students received didactic training on periodontal data collection that included lectures and instructional videos on measuring or determining

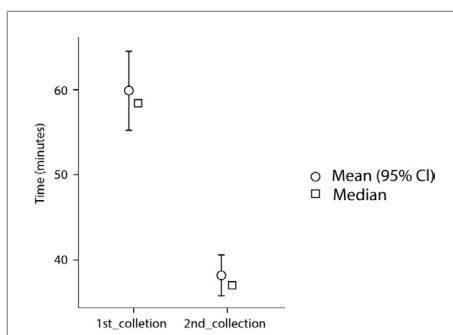


FIGURE 2. Mean time (minutes) spent on first and second perio data collection.

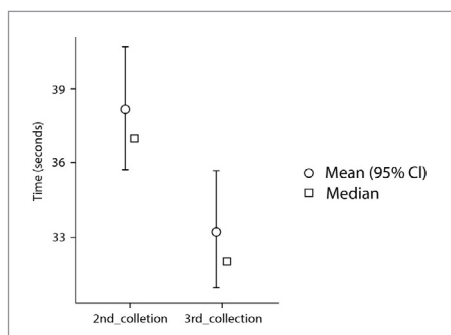


FIGURE 3. Mean time (minutes) spent on second and third perio data collection.

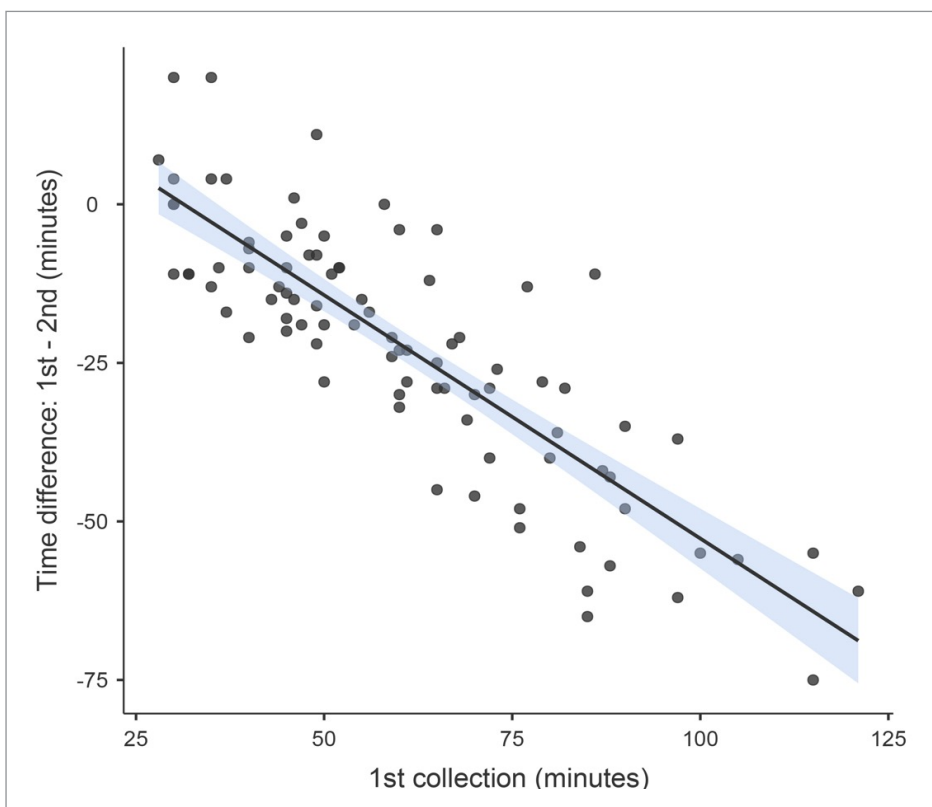


FIGURE 4. Time improvement (minutes) in first and second data collection.

data collection, a total of four surveys were conducted. A presurvey before the first periodontal data collection and three postsurveys after each of the data collection activities were distributed to students using the Qualtrics system (FIGURE 1).

In the presurvey and three postsurveys, a question about their confidence level as clinicians was asked using a 5-point

Likert scale ranging from “strongly agree” to “strongly disagree.” The surveys also asked about the most challenging components or concepts of periodontal data collection among PD, CAL, GR, mobility and furcation involvement.

In order to evaluate the hypothesis, one sample t-test, the Friedman test and Pairwise comparisons were used to statistically analyze whether there was

any significant difference in time lapse between first and second data collection and between second and third data collection. To evaluate if there was any correlation between time improvement and student clinicians’ confidence level, the Kruskal-Wallis test was utilized.

Results

Time Spent on Periodontal Data Collection

The mean completion time for the first periodontal data collection was found to be 60.5 minutes (min) and 38.2 min for second periodontal data collection (FIGURE 2). The time difference or time improvement between first and second periodontal data collection was calculated to be 22.3 min. Between the second and third periodontal data collection activities, the mean time was reduced from 38.2 min to 33.3 min, which showed 4.9 min time improvement (FIGURE 3). A paired sample t-test was used to analyze the statistical significance of the time difference or time improvement between each periodontal data collection. The P value for the 22.3 min time improvement between first and second periodontal data collection was found to be less than 0.001 ($P < 0.001$). Similarly, the P value for the time difference between the second and third periodontal data collection resulted in less than 0.001 ($P < 0.001$).

Students who spent longer time on their first periodontal data collection showed greater time improvement on their second periodontal data collection (FIGURE 4). Similarly, student clinicians who spent more time during their second periodontal data collection showed greater time improvement on their third data collection (FIGURE 5).

A Friedman test and Pairwise comparison were also conducted to determine whether collection times differ among the first, second and

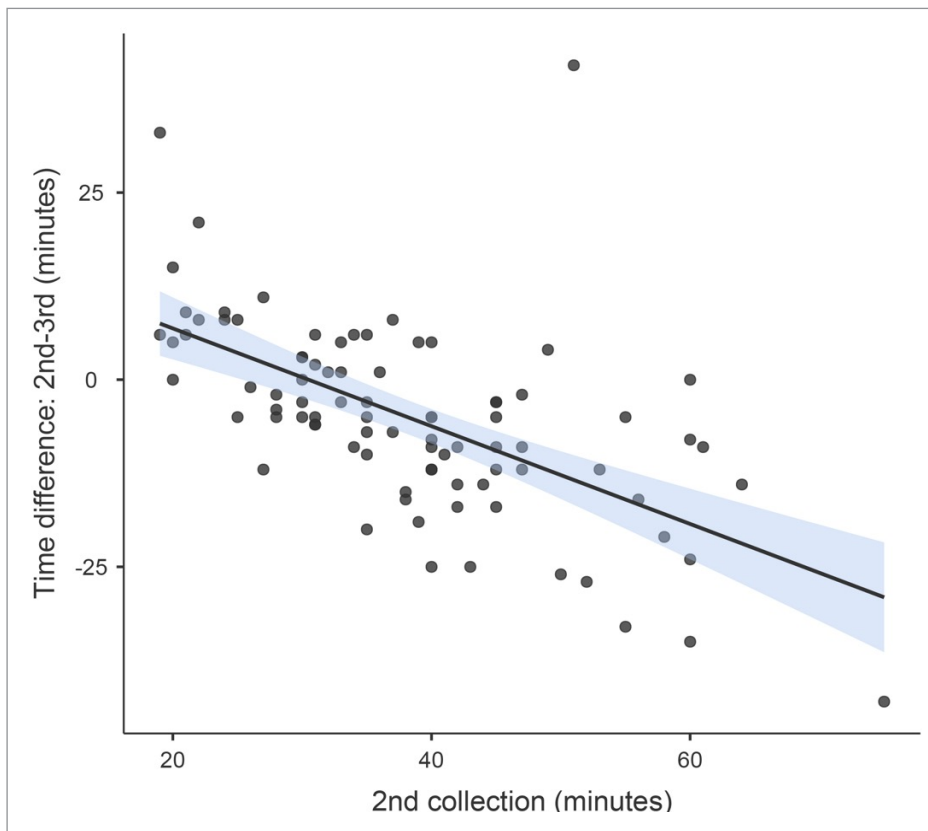


FIGURE 5. Time improvement (minutes) in second and third data collection.

third collections. The results showed statistically significant differences, $\chi^2(2) = 99.0$, $p < 0.001$. We reject the null hypothesis and conclude that statistically significant differences exist among the three periodontal data collection periods (**FIGURE 6**).

Confidence Level of Student Providers

Kruskal-Wallis tests indicated that no statistically significant difference was present in periodontal data collection time between confidence groups at postsurvey 1 [$H(1) = 2.09$, $p = .098$] and postsurvey 3 [$H(1) = 1.65$, $p = .200$] (**FIGURE 7**). However, in postsurvey 2, collection times were significantly lower among students who reported confidence in collecting data [$H(1) = 5.60$, $p = .018$]. Thus, we fail to reject the null hypothesis for periodontal collection times 1 and 3 (**FIGURE 8**).

Discussion

Repeated clinical practice has been shown to reduce the time taken to complete a periodontal data collection as well as increase the clinicians' confidence.² As seen here with novice dental students given three periodontal data collection practice sessions, the time taken to gather periodontal data decreased significantly ($p < 0.001$).

After the first and third periodontal data collection, the student group who agreed or strongly agreed to confidence in postsurvey did not have a statistically significant difference in time they spent on periodontal data collection when compared to the student group who reported disagree or neutral response (mixed group). However, there was a statistically significant difference in the second postsurvey after second periodontal data collection, which showed that students who reported confidence spent

significantly less time on periodontal data collection. This data indicates that the second data collection time would be a meaningful time to intervene and provide additional educational support or resources to students to improve confidence.

Many students indicated that CAL was the most difficult periodontal data concept throughout the practice (**FIGURE 9**). In the presurvey, about 60% of students responded that CAL was the most difficult periodontal data component, and about 78% responded the same way after they performed periodontal data collection. An increased number of students felt that CAL was a difficult concept to apply clinically. Periodontal disease is characterized by attachment loss, which is measured from the CEJ to the base of the probeable pocket. CAL can be misinterpreted and often hard to measure because the CEJ can be challenging to visualize and oftentimes may not be well defined.¹⁰ Identifying and measuring attachment loss on the interproximal surfaces can be a greater challenge as compared to direct buccal or lingual surfaces;¹⁰ therefore, more practice sessions with a focus on understanding and measuring CAL in the various scenarios would be beneficial for students. Additionally, short tutorial videos can be shown to students before their periodontal data collection and small group live demonstrations can be conducted by periodontal faculty in the clinic at the beginning of the clinic activity. It would be beneficial for students if they were able to practice CAL measurement on typodont with various periodontal health conditions and demonstrate their skills and understanding of CAL to instructors before they check CAL on their patients. It is imperative for students to have enough practice with good learning tools or equipment to maximize their learning.¹¹ One study in Japan showed that the newly

Repeated Measures ANOVA (Non-parametric)

Friedman

χ^2	df	p
99.0	2	< .001

Pairwise Comparisons (Durbin-Conover)

		Statistic	p
1st collection (minutes)	- 2nd collection (minutes)	10.64	< .001
1st collection (minutes)	- 3rd collection (minutes)	14.42	< .001
2nd collection (minutes)	- 3rd collection (minutes)	3.78	< .001

Descriptives

	Mean	Median
1st collection (minutes)	60.5	59.0
2nd collection (minutes)	38.2	37.0
3rd collection (minutes)	33.3	32.0

FIGURE 6. Friedman test and Pairwise comparisons for first, second and third perio data collection time.

developed model designed for pocket depth measurement training can be effective for students to practice.¹² Second-year students can also pair up with upper classmates after their required preclinical periodontal data collection training. When upper classmates see patients during COEs or POEs, second-year students could participate in or observe periodontal data collection on actual patient cases with periodontitis.

One of the most common concerns in the student dental clinic at LLUSD is that it can take a significant amount of time to complete COE and POE, as collecting various data slows down the student clinician, one of them being periodontal data.

Students' clinical abilities perceived

by patients reduce dental anxiety in patients, and the possibility of the patient being anxious increases with long dental appointments.¹³ Therefore, providing students with multiple practice opportunities can result in the student being more efficient and confident, thus reducing the time taken and ultimately reducing patients' anxiety and increasing patients' comfort level.

A limitation of this study is that the accuracy of the periodontal data collected by students was partially evaluated by faculty. Faculty reviewed the recorded data and radiographs in the clinic and spot-checked PD, CAL and other data when needed. Feedback was given to

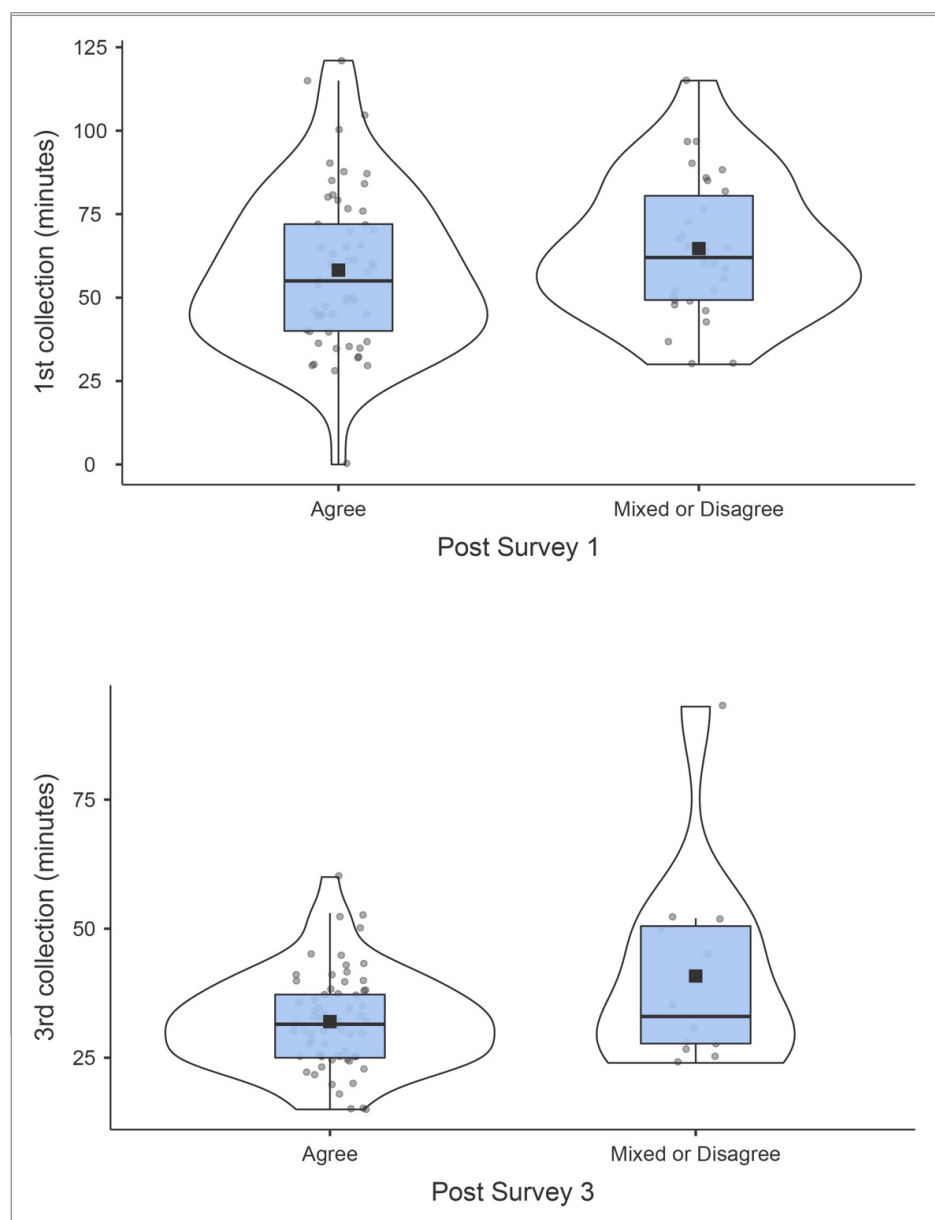
students during the time of periodontal data collection. The full-mouth data verification was not feasible with a limited number of faculty and limited time allotted to the clinic sessions. However, after data collection activity, students had a separate case presentation session in the clinic for comprehensive oral evaluation treatment planning, and instructors were able to review the overall collected data and check certain areas as necessary to confirm periodontal diagnosis and periodontal treatment plans. Evaluation of the accuracy of the full periodontal data that students collected could be a future research project.

Another drawback of this study is that the patients with whom students worked were primarily their young and healthy classmates. Students were mainly working on healthy gingiva or healthy gingiva with reduced periodontium or gingivitis cases. Most of the students were not able to assess periodontal data collection on active periodontitis cases due to the nature of the patient pool. Examining or collecting data from a patient with periodontitis may be a much different experience for the students, and they may face some challenges compared to the practice sessions. However, one study that assessed students' probing depth consistency with the use of audio-video method showed that there was no significant difference for the gingivitis and periodontitis patients.¹⁴

Conclusion

There was statistically significant time improvement between the first and second periodontal data collection and between the second and third periodontal data collection. Statistical significance was also seen between students' confidence level and improved data collection time especially during the second data collection.

The results of this study are significant



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THE CORRESPONDING AUTHOR, Soh Yeun Kim, DDS, can be reached at sokim@llu.edu.

FIGURE 7. First and third data collection time and student response group for postsurvey 1 and 3.

in proving that repetitive practice is a valuable method of learning to establish a foundation that will guide students in being efficient by decreasing chair time and being confident in patient care. ■

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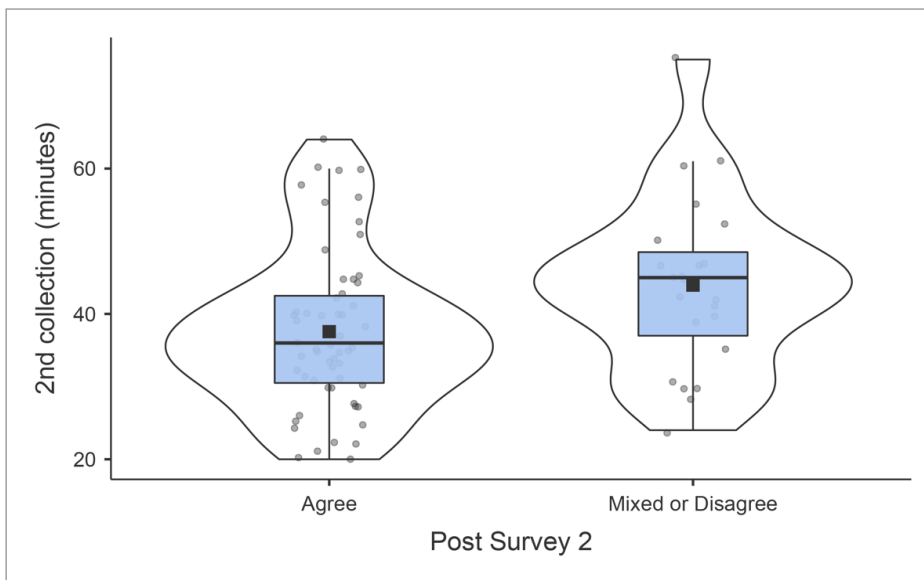


FIGURE 8. Second data collection time and student response group for postsurvey 2.

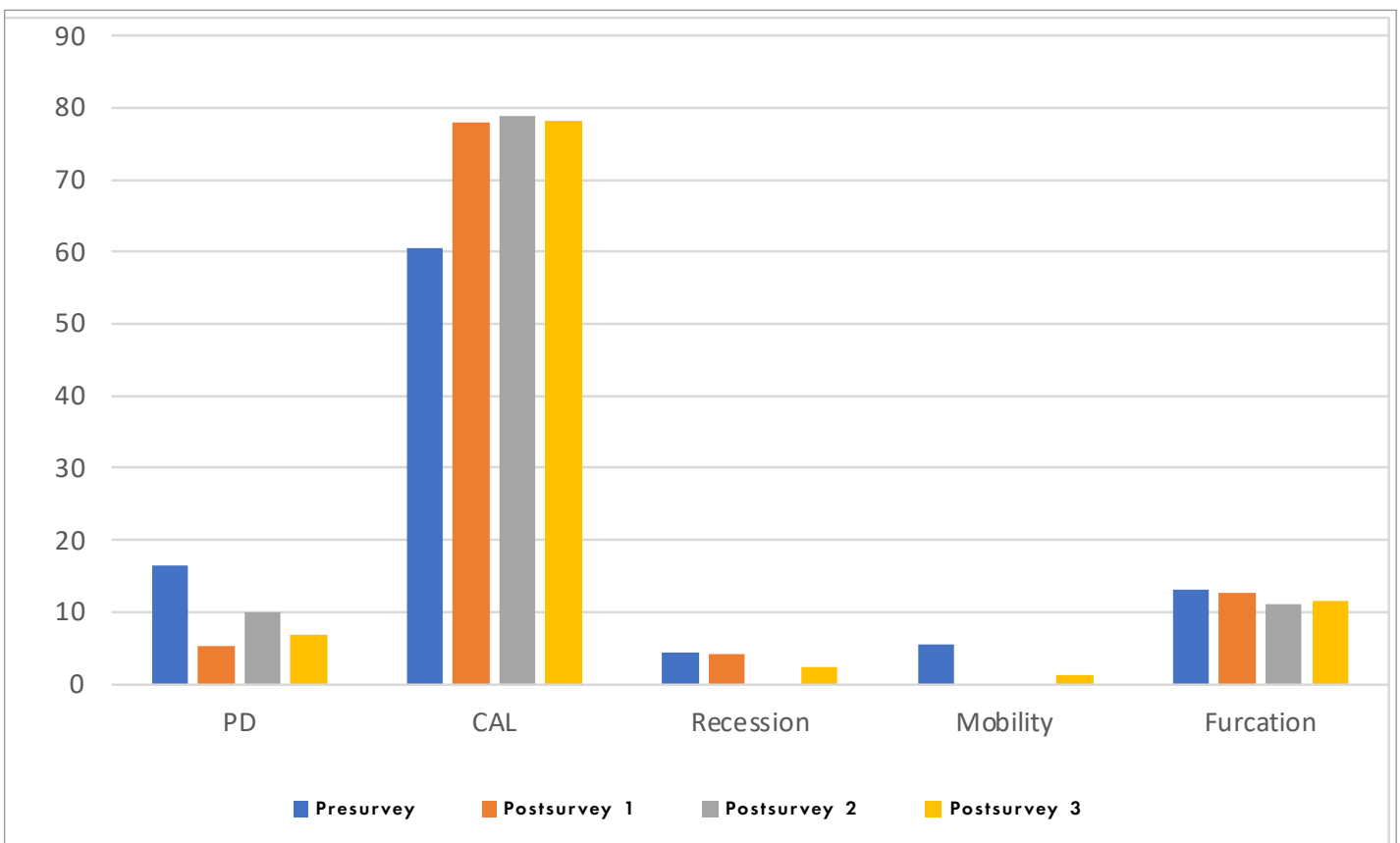


FIGURE 9. Percent of students identifying clinical attachment level (CAL) as the most difficult component of periodontal data collection.