Effects of Limited Face-to-face Classes on the Psychomotor Skills of Dental Students: A Qualitative Study

Isabelle M Beato, Labinnah Mae R. Buclatan, Liekken Marie A. Eguia, Angel Nicole H. Garcia, Nathalya Bmay Opeña-Subido, Denise B. Espanto, Giovani P. Mercado, Herminiano Jr. I. Subido, Amiel Jozcef A Subido *
Adventist University of the Philippines

ajasubido@aup.edu.ph

ABSTRACT

The COVID-19 pandemic necessitated a shift to virtual learning in dental education, raising concerns about developing essential psychomotor skills. This qualitative study aimed to explore the experiences of dental students who had limited face-to-face learning during the pandemic and delve into their perceptions of how virtual learning environments impacted their ability to develop psychomotor skills in dentistry. The study involved conducting semi-structured interviews with twelve dental students, including both pre-clinical and clinical students who experienced varying degrees of limited face-to-face learning due to the pandemic. The results of the study described the varied experiences of dental students, shedding light on the convenience or challenges they faced. Factors such as the "no patient policy," changes in Personal Protective Equipment (PPE) protocols, online learning, and other internal and external factors that posed challenges and influenced learning and psychomotor skill development were discussed. Additionally, the study described and analyzed factors that influenced how students adapted to these changes. The study revealed a perceived negative impact on the development of psychomotor skills. However, it noted that the change was not entirely disadvantageous, as students were able to adapt and take advantage of the new setting. The study recommends further research to validate the results of this study and to analyze how to incorporate helpful factors to optimize psychomotor skill development in current learning practices.

Keywords: *Psychomotor Skills, Online Learning, Limited Face-To-Face*

INTRODUCTION

During the COVID-19 outbreak, the educational system, specifically dental education, temporarily shut down (Alfodeh et al., 2021; Amir et al., 2020). Dental schools around the world underwent significant changes, with a rapid shift to an online learning approach. Since professors and students are in the same interactive online environment but in different physical locations, synchronous online learning functions similarly to traditional classrooms (Badovinac et al., 2021).

Despite the quick implementation of online learning and the successful transition of faculty to remote instruction, students were unable to have direct contact with patients (Ilic et al., 2021). The transition to online learning and the lack of hands-on instruction may leave students lacking confidence when conducting dental treatments. Limited face-to-face learning allows live interaction between students and professors, with class meetings scheduled in advance. Dental students opting for limited face-to-face classes may work in a dental laboratory if they are fully vaccinated and have medical insurance. Psychomotor skills are essential in dental education, and students need to handle patients to improve these skills. However, due to the restrictions, dental students could only use dummy articulators as alternatives to patients (Casiple, R, 2021).

Practical laboratory sessions and clinical patient requirements are crucial, but due to limited face-to-face learning, this resulted in fewer opportunities for skill practice, less direct contact with professors and patients, and fewer practical requirements. Thus, this study aims to explore the experiences of dental students during limited face-to-face classes and their perceived impact on their psychomotor skills.

LITERATURE REVIEW

Limited Face-to-Face Learning in Dentistry

During the global pandemic due to the COVID-19 virus, the necessity for instructional methodologies to respond to social change is critical. Due to the potential virus spread through direct or indirect contact, this issue has had a substantial impact on educators' and students' safety when working in a confined environment of a classroom (WHO, 2020). This mode of teaching, however, is unlikely to change due to its flexibility to accommodate a variety of learning situations, such as during environmental disasters. Limited face-to-face provides a way to manage this ever-changing learning environment while offering excellent teaching methods. It refers to limiting the number of students who can attend face-to-face classes on campus with cyclical student shifting/rotating schedule while observing physical distancing, and other health and safety standards (Legal Education Board, 2022). With the significant increase in online education during the COVID-19 pandemic, educators now have a greater need to employ teaching strategies that do not rely solely on "face-to-face" learning. One such technique is blended learning (BL), which allows for greater flexibility in delivery and continuous access to learning materials. (Jenkins, L. E., & Crawford, R.,2021).

The pandemic constraints may have a favorable effect on pupils' performance. The quarantine shifted students' learning habits to a more efficient, productive routine with better levels of engagement (Hattar, S., et al., 2021; Amir et al., 2020), Despite their accomplishments, many students believed that the switch to online platforms because of the COVID-19 pandemic had harmed their clinical performance, with the limited exposure to patients hindering their development of clinical skills, professionalism, and even confidence (Van Doren et al., 2020). In a study by Van Doren et al. (2021), students appreciated online instruction but believed it could not replace direct patient care. Sharka et al. (2020) supported this, stating that while online

education may be sufficient for theoretical and non-clinical teaching in the first three years of dental school, it cannot substitute for clinical training, which requires hands-on experience.

Psychomotor Skill in Dentistry

As part of the laboratory requirements in dental education, it is essential to develop psychomotor skills (Lugassy et al., 2019). Psychomotor skill is the ability to coordinate physical movements with mental processes to perform precise and controlled procedures. These skills are critical in tasks that require hand-eye coordination, fine motor control, dexterity, and manipulating dental tools within a small and delicate working area like the mouth. Before handling an actual patient, a dentist must develop psychomotor skills throughout their first years of study. Knowledge and cognition are applied with eye, finger, and body motions. In tandem with their psychomotor capabilities, they also learn to improve spatial abilities, cognitive abilities, indirect visualization, cavity depth evaluation, and self-positioning as other skills enhanced in preclinical exercises. (Khan, S. et al. 2020). Working in preclinical laboratories as part of a dentistry program helps students enhance their psychomotor abilities.

Factors Affecting Skill Development

Several critical aspects of skill learning just like psychomotor skill development have been discovered in the present literature. These are divided into two categories: Internal and External factors. Internal factors include theoretical knowledge (Suksudaj, et al. 2011; Zacok, et al., 2020; Ahmed, 2020; Bradley, 2012), innate ability (Khan, et al. 2020; Upadhyay, et al. 2017), and motivation (Khan, et al. 2020; Suksudaj, et al. 2011). On the other hand, external factors include support and supervision (Seymour- Walsh et al., 2020; Mwale & Kalawa, 2016; Hattar, S. et al., 2021; Quinn et al., 2003), availability of resources (Mwale & Kalawa 2016; Laureano et al., 2021), feedback (Suksudaj, 2010), and opportunity to Practice (Mwale & Kalawa, 2016).

METHODS

Research Design

This study utilized a qualitative research design while employing a phenomenological research design. This design involved two phases namely the narrative and interpretive phase. The study used van Manen's hermeneutic phenomenology, a technique that focuses on the various experiences of human existence as they are lived through is called hermeneutic phenomenology. Referred to as "lived experiences," these specific instances of the phenomena are categorized into fundamental themes using text readings and descriptions. The character of the lived experiences is then better understood and connected to human reality through these themes (Van Manen, 1990; 2014).

Sampling

The sampling method used in this study is convenience sampling as it was difficult to gather participants during the pandemic. Participants of this study were twelve pre-clinical and clinical dental students at Adventist University of the Philippines who participated in the limited face-to-face during the first semester of school year 2021-2022.

Ethical Considerations

Permission from the private institution was collected and properly documented. Written signed consent was collected from the participants before the interview, guaranteeing privacy, confidentiality, and proper use of the data gathered. The researchers had a private platform for all the data and evidence provided by the respondents and can only be accessed by the researchers. This study, together with the questionnaire, was subjected to the guidance of the Adventist University of the Philippines Ethics Review Board to avoid any violation of ethical rights.

Data Collection and Analysis

A semi-structured interview was used to collect data from the twelve participants. The questionnaire contained 15 open-ended questions that allowed for an in-depth analysis of factors contributing to the perceptions and experiences of the dental students. The questionnaire used in this study was selected from existing literature and was modified to fit the objective of this study. After the interview questions were validated and approved, the interviews took place in a quiet and secure room to ensure clear communication and quality audio recordings, which were later transcribed and compiled. Below are the three main research questions that were answered to reach the objectives of this study:

1. What are the experiences of pre-clinical and clinical students who attended limited face-to-face classes?
2. How do the limited face-to-face classes affect the psychomotor skills of pre-clinical and clinical dental students?
3. How did the preclinical and clinical students deal with the effects of the limited face-to-face classes on their psychomotor skills?

After data collection, the researchers read every statement, phrase, and word to identify relevant experiences. The next step was clustering and thematizing the invariant constituents of the experience. The participants' responses were grouped into meaningful units that relate to the participants' experiences. The meaningful unit, including the participants' statements of their experiences, was identified and clustered into themes. Once an initial sense of the data was obtained, the coding process began. The researcher also compared and connected the codes to determine consistency among data. The findings were presented to the participants to validate the accuracy of the interpretation of their experiences.

RESULTS AND DISCUSSION

Experiences of Students Who Attended Face-to-Face Classes

Table 1 below shows the main themes that describe students' experiences during limited face-to-face classes. In terms of finishing laboratory requirements, three out of twelve students claimed that it was convenient, allowing them to work at their own speed which is consistent with the study of Alfodeh et al. (2021). Also, because no patients were allowed, they were required to simulate the process using dummies and dental articulators. This made the requirement easier to accomplish as there were no complications in communication and patient compliance. It was also reported that there was a higher level of engagement during online classes that may contribute to the perception of easier requirements (Hattar, S., et al., 2021; Amir et al., 2020). On the other hand, most of the population saw the experience as challenging due to the shorter time to accomplish the requirements, communication difficulty with the professors as all conversation is done online, difficulty translating theory into practice and skill, and less opportunity to practice. Some students claimed that the limited access to dental materials and the feeling of losing momentum to work affected their completion of laboratory requirements negatively. Thus the feeling of missing out on critical learning opportunities was also apparent just like in the survey done by Von Doren et al. in 2020. However, in this study, professionalism was not an issue compared with what was reported in the survey.

Table 1

Themes Under the First Research Question

Sub-questions	Themes
How did limited face-to-face classes affect the completion of dental laboratory requirements?	● Convenience ● Challenges
What are your thoughts regarding the "no patient policy"?	● Lesser Competency ● Health Safety ● Efficient Work
What are the advantages and disadvantages of online learning?	Advantage: ● Accessibility ● Safety ● Autodidactic Disadvantage ● Accessibility ● Slackness

Research Question 1: What are the experiences of pre-clinical and clinical students who attended limited face-to-face?

The "no patient policy" causes the majority to feel a lack of confidence and competence in handling live patients even though some felt it was more efficient to work without live patients and safer in terms of health. This loss in confidence is consistent with the studies of Illic et al. (2021) and Van Doren et al. (2020) as an inevitable consequence of reducing or eliminating practice with live patients. Participants in Van Doren et al. study added that online case discussions teach critical thinking but still will not replace critical thinking skills gained through patient-care experiences.

Students claimed that online learning is advantageous as it is more flexible than traditional learning. Many students described the accessibility of online lectures and resources using their devices as very helpful in their studies. Online learning was self-directed learning that gave them the freedom to learn at their own pace and adjust their learning style (Alfodeh et al., 2021). Conversely, accessibility posed a disadvantage due to unstable internet connections. Amir et al. (2020) found that although most students viewed online learning as more efficient, only 44% preferred distance learning over traditional classroom methods, largely due to these accessibility issues. Other than this, the main disadvantage described was slackness due to the distractions in their environment and lack of supervision. Students should be given clear instructions, and they should not be left in the dark about decisions that may directly affect their education. Although dental students usually are competent in doing treatments properly, research has revealed that they nevertheless feel unprepared and need supervision (Hattar, S. et al., 2021). This close monitoring and supervision would then prevent slackness among students in doing the procedures properly.

Effects of the Limited Face-to-face Classes on Psychomotor Skills

Psychomotor skills are shaped by both internal and external factors, as themes are shown in Table 2. Focusing first on internal factors, theoretical knowledge plays a significant role. Limited face-to-face learning pushes students to depend on online resources (Ilić, 2021), such as diagrams, illustrations, and videos, which provide a conceptual framework for understanding and practicing techniques. Visual aids, including slow-motion demonstrations, simplify complex procedures, helping students improve their instrument handling. While hands-on experience may be restricted, it lays a foundation for further skill development in clinical tasks (Al-Zain et al., 2021).

Table 2

Themes Under the Second Research Question

Sub-questions	Themes
How will you apply the knowledge you've learned during online classes in your preclinical and clinical requirements?	● Review of Materials ● Experience
What are your thoughts on dental students with inborn talents (innate abilities) that influence their clinical performance?	● Advantage in Dexterity ● Developing Skills

How do you keep motivated in doing your clinical requirements during limited face to face?	• Supporting System • Goals
What are the differences between having support and supervision from your professor online and the traditional learning method? How does it affect your psychomotor skills during your clinical practice?	• Communication • Lack of Physical Guidance • No Difference
How did the availability of materials in the laboratory affect your psychomotor skills during the limited face-to-face classes?	• Loss of Momentum • No Effect
What are the differences between having a live patient and using the dummy articulator?	• Incautious • Cautious
As a dental student, how important is the instructor's feedback regarding your psychomotor skills?	• Enhanced Performance
How can you say that your psychomotor skills somewhat improved considering the early dismissal to do your clinical requirements during the limited face-to-face classes?	• Time Pressure • No Improvement
How does wearing of PPE (coverall suit, head cap, mask, face shield, gloves, shoe cover etc.) affect the performance of your skills?	• Safety • Discomfort • Inconvenient

Research Question 2: How do the limited face-to-face classes affect the psychomotor skills of pre-clinical and clinical dental students?

Additionally, students acknowledge that innate artistic and dexterous abilities, often seen in children of dental practitioners, give an advantage when practice is limited. However, they agree that skill improvement ultimately depends on practice. Motivation also plays a critical role, with family, friends, professors, and spiritual beliefs offering essential support. Family was identified as the primary source of motivation, while spiritual beliefs were mentioned less frequently. An individual's motivation has a substantial effect on motor performance. It is one of the internal processes and traits of a learner that might affect motor performance. (Khan, et al. 2020). Personal goals, such as completing the program to alleviate financial burdens on parents, further drive students' motivation as a minority of participants claimed.

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External factors also significantly impact psychomotor skills. During limited face-to-face sessions, CIs struggled to provide proper supervision, resulting in discrepancies between students' submitted photos and actual lab work. This led to inaccurate feedback and hindered skill development. The lack of direct observation also prevented CIs from offering physical guidance and demonstrations. This aligns with the study of Minihan (2022), who noted that inadequate support left students feeling unprepared and stressed. Additionally, the limited availability of materials restricted practice opportunities, delaying work and affecting students' momentum and motivation. Mwale & Kalawa (2016) claimed that students could not acquire the

skills due to a lack of clinical resources which resulted in frequent improvisation. However, about a quarter of the students reported no issues with material availability.

Other factors affected psychomotor skills during limited face-to-face learning. The use of dummy patients presented clear disadvantages, as they lacked the empathy and responses of live patients, making it challenging to simulate real-life scenarios like tongue movement, fluid secretions, and pain response. This leads to incautious behavior of students. These findings align with Løset et al. (2022), who stated that patient care is necessary for the development of technical skills required in the dental profession, and this type of instruction is challenging to digitize because it involves patient treatment and empathy. In the same manner, Halim (2021) stated that students must understand how to interact with patients during history taking. This cannot be accomplished just through online learning, instruction, and feedback. While feedback was generally detailed and beneficial for improving knowledge and skills, its effectiveness depended on the quality of submitted photos and communication with clinical instructors. This result agrees with Bunyan (2020) and Landau (2020), that lecturers and dental students must have an excellent and stable internet connection and good technical computer skills to have suitable online classes. This is one of the most significant challenges both sides confront when participating in distance online learning.

Additionally, students had less time to complete tasks compared to traditional learning. This time constraint led them to work faster, prioritize quality over quantity, and enhance their resourcefulness. Although the students were able to find benefits in their situation, Mwale and Kalawa (2016) showed that mastering a skill greatly depends on time spent practicing. The students in that study claimed that mastering a skill was challenging because they did not stay long in a particular clinical placement. Only one participant in this study is consistent with Mwale and Kalawa as that student noted that while knowledge improved, psychomotor skills did not even though there was a factor of time pressure pushing them to work and learn faster. Furthermore, students had to adhere to new infection control protocols, including wearing PPE such as coveralls, masks, and face shields. They reported that donning and doffing PPE caused delays in procedures and hindered performance by limiting vision and movement. This finding is in line with the study of Abdulbaqi et al, 2021, that health care professionals who have worn PPE for extended periods have reported weariness, thirst, and headaches. These negative impacts were exacerbated by their fear of infection, which contributed to more stress on their decision-making, treatment quality, and overall performance.

How Students Deal with the Impact of Limited F2F Classes on Psychomotor Skills

All students deal with the effects of limited face-to-face on their psychomotor skills by taking advantage of social media platforms like Youtube and Instagram to supplement their learning as they gave them tips, tricks, visual aids, and easier-to-understand practical guides (see Table 3). This finding consistent with Van Doren (2020), which stated that "Online clinical-teaching technologies such as virtual patient interactions are commonplace in medicine, and our results indicate that similar tools could benefit dental students. When asked what tools would

help facilitate remote learning, second-year students suggested videos of dental procedures, recorded lectures, and exercises to improve hand skills from home."

Table 3

Themes Under the Third Research Question

Sub-questions	Themes
What are the learning tools do you use during the limited face-to-face?	● Social Media Platforms ● Books and E-books ● Other Online Applications
How does your learning method change based on the current limited face-to-face mode?	● Change in Study Habit ● No Difference

Research Question 3: How do preclinical and clinical students deal with the effects of the limited face-to-face classes on their psychomotor skills?

Students were also able to adapt by changing their learning habits. These learning styles of students changed mainly through the transition of physical learning tools like books and handwritten notes to soft copies of books, class video recordings, and access to the PPT of the professors. This led to the opportunity to easily rewatch and go back to the materials and study at their own pace on their own flexible schedule (Badovina, et al, 2021). Due to this, students tend to adapt and become more disciplined and organized. This led to self-regulated learning that positively affects performance (Hattar, S., et al, 2021). However, as mentioned above, slackness can also occur as self-directed learning requires them to manage their own time. Lastly, changes from group study to self-study and vice versa were dependent on the student's environment during those times as they saw fit. As evidence suggests, there was a better interaction among classmates (Al-Fodeh, R., et al., 2021) thus self-study to group study online was evident during those times.

CONCLUSION, IMPLICATION, LIMITATION, AND RECOMMENDATION

In conclusion, this study describes and answers three main questions. First, it describes the situation of the limited face-to-face during the 1st semester of SY: 2021-2022 as it poses both some convenience and more challenges to the students. Secondly, it described the impact of limited face-to-face to the psychomotor skill development of the students. While online lectures provided theoretical knowledge, students highlighted the need for practical application. The knowledge they've learned served as a guide in labs and clinics. External and internal factors that negatively impacted skill development were also discussed. Finally, it describes how the student dealt with the effect of this new learning method on the development of their psychomotor skills as they adapted different learning strategies and were able to make use of all online resources and platforms.

The study offers valuable insights into the impact of limited face-to-face classes on dental students' psychomotor skills and learning methods, guiding future research and educational strategies in dentistry. As the study is qualitative, it only reflects students' perceived impact on their skills, not their actual performance. While some may feel less skilled compared to those in full face-to-face programs, factors like innate ability may result in better performance even under limited face-to-face. Further quantitative research is recommended to validate these findings and identify the most effective learning methods for skill development.

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